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Master's Thesis of City Planning

Spatial Analysis of After-School Child Care Facilities in Seoul, Korea

: A Step Toward Universal Care

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Abstract

Nowadays, there is growing recognition for the provision of universal child care. Studies have shown the effectiveness of universal child care in reducing social inequality and potential social costs from the child care gaps. In Korea, emphasis has been put on establishing public child care since the revision of the child welfare act in 2004 and the Basic Act on Low Fertility and Aging Society in 2005. However, a lack of attention has been given to assessing the regional accessibility of child care services. Therefore, this study aims to measure the service accessibility of child care facilities across Seoul, Korea, analyze the areas with over or undersupply, and investigate the relationship of the regional characteristics to child care accessibility. From the analysis, the study has found that the spatial distribution of child care accessibility corresponds to the economic status of the regions, yet there, the child care supply did not parallel with the population of families with children. Also, the accessibility of child care in Seoul is far less than the surveyed demand ratio. Lastly, of all the regional characteristics, the population of children and land price had a significant negative relationship to the child care accessibility, and the population of National Basic Living Security recipients had a significant positive relationship to the accessibility. This study has originality in bringing together two topics from different disciplines, which are universal care and accessibility, obtaining empirical findings from the microscopic spatial analysis that estimated spatial accessibility using detailed

demand population in the service windows. These findings offer a comprehensive understanding of the current landscape of universal child care accessibility in Seoul.

Keyword: Universal Child Care, Spatial Accessibility, Two-Step Floating Catchment Area (2SFCA), Spatial Analysis on Social Services, Social Infrastructure Planning, After-School Child Care

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Chapter 1. Introduction

1.1. Research Background

Why should we care about care? The recent outbreak of COVID-19 has opened our eyes to inequalities among children. While children from families with better-off social, economic, and cultural backgrounds promptly responded to the changes in an educational environment, the children in vulnerable conditions faced a decrease in academic achievement and an increase in academic deficit rates and dropout rates (Andrew et al., 2020; UNESCO, 2020; UN, 2020; 김경애, 2020; 이정연 외, 2020). As can be seen from the pandemic experience, inequality begins early.

With public investments in child care, inequality can be lessened. Instead of making the child care full responsibility of caregivers, if the state actively contributes to providing quality child care service for the children in need of care, this reduces the social costs that could have risen from the gaps in child care, such as discontinued labor, low fertility rate, aging society, and children in jeopardized environments.

While developed countries such as Canada, Scandinavian countries, European Union, and the United States have already implemented or declared their expanded investment in the universal child care program, some critical

questions need to be answered to effectively implement the universal child care policy: How is the child care service provided? Who are the primary users of the service? What is the level of supply and demand? If the service is to be expanded, where should it be? Where are the areas that undergo severe service shortages? In other words, an evaluative assessment of service availability must take place to allow further policy intervention.

Nevertheless, prevailing studies on universal child care only convey economic returns and long-term effects. Up to now, far too little attention has been paid to the spatial characteristics of child care services. In Korea, there is a great emphasis on universal child care. The government is expanding child care services to fight against inequality in children mainly through the Basic Plan for Low fertility and Aging Society and the child care policies. However, despite the intent, the implementation has been done crudely.

First, there are similar yet different child care facilities with disparate administrative bodies, which are the Elementary Care Class (ministry of education), Community Child Care Center, and Together Care Center (ministry of health and welfare) hard to grasp which regions lack accessibility to overall child care services. In addition, these facility types have their operating bodies and source of operation fees which adds another complexity to increasing the child care supply. Furthermore, after the nullification of the planning regulation that mandates the installation of public facilities near residential zones in 1999, the child care facilities were installed through a

bottom-up approach where the potential owner applies and gets approved to provide the service. Lastly and most importantly, there lacks research that assesses local accessibility of child care services.

1.2. Research Objectives & Questions

To advance the discussions on universal child care and its service distribution, this paper aims to provide a refined assessment of child care accessibility, especially across Seoul, Korea, where its application of universal child care lacks a planning perspective. Therefore, the objectives of the paper are:

1. To measure the service accessibility of child care facilities across the study area
2. To analyze the areas with over or undersupply
3. To investigate the relationship of service accessibility to the regional characteristics

With these objectives, this paper answers the following questions: Where are the areas of over or undersupply of child care services in Seoul, and which of their attributes influences service accessibility? Finding answers to these questions will help to comprehend the current landscape of universal child care accessibility in Seoul.

1.3. Research Method

This study takes the form of a case study on child care, specifically the after-school services for elementary school students in Seoul, Korea. Since there is a lack of literature on the distribution, allocation, and accessibility of Seoul's child care services, the analysis is exploratory, performing initial investigations to find the distinctive characteristics and patterns in the child care landscape in Seoul.

The analysis is threefold. First, the service accessibility is calculated using 2SFCA (two floating catchment area) in cells of 100m x 100m. Then, the accessibility score is aggregated to a bigger census tract ("Dong"), and the region's socio-economic characteristics are compared between the groups with high accessibility and low accessibility. Lastly, a regression analysis assesses the relationship of regional characteristics with accessibility.

In addition, because the three major child care facilities (Elementary Care Class, Community Child Care Center, Together Care Center) have discrete operation systems and funding bodies, their location patterns may differ, which may bring difficulty in evaluating the universal after-school child care in Seoul. Therefore, the aforementioned research methods are applied to each facility type, as well as the 'universal child care measure' that compiles the facility types as homogeneous service providers.

1.4. Structure of the Thesis

The rest of the thesis follows this structure. In chapter two, literature on universal child care and care accessibility is reviewed to provide the study's theoretical background. In chapter three, the child care policies and different child care facility types in Korea are described to explain the context of the study. Chapters four and five present the analysis, and lastly, chapter six summarizes the results and discusses the study's implications and limitations.

Chapter 2. Literature Review

2.1. Social Inequalities in Childhood

Inequality begins early. Due to the financial burden and psychological pressure that follows, children in disadvantaged backgrounds are prone to meet with jeopardized environments and inadequate parental support for learning and development (Byun et al., 2012; Lareau, 2011; Heckman & Mosso, 2014; Kalil, 2014; McLoyd, 1990; Vandell & Ramanan, 1991; Yeung et al., 2002).

In addition to the economic superiority, cultural capital obtained by privileged parents offer more desirable conditions for a child. Cultural capital, measured by language use, habits, or attitudes socially learned from families and peers (Bourdieu, 1986; Throsby, 1999), influences how teachers respond to a child. For instance, children from the middle-class are more likely to receive more favorable responses from their teachers than working-class children (Farkas, 2018; Thompson, 2019). Furthermore, parents from lower socioeconomic groups have limited networks that constrain them from equal access to institutional resources (Coleman, 1988; Schneider et al., 1997; Lareau, 2014).

Therefore, public investments in child care ensure that children, especially those from disadvantaged backgrounds, have access to equal opportunities and quality developmental support, improving cognitive and non-cognitive skills (Heckman, 2006; Hoynes & Schanzenbach, 2018; Heckman & Karapakula, 2019). In other words, the provision and expansion of universal publicly funded child care allow better opportunities for children from disadvantaged backgrounds and ultimately contribute to lessening social inequality experienced at a young age.

2.2 Equity in Universal Child Care

Child care aids children's long-term development, thus lessening inequality by benefitting disadvantaged children. Therefore, publicly funded child care services, removing cost barriers for low-income families in accessing child care, can raise secondary earners' labor supply and result in better social and educational outcomes for the children, which ultimately increase the future workforce (Warner & Prentice, 2013). There are numbers of empirical research that account for such an argument. For example, using data from Head Start, Kline and Walters (2016) found that the initial impact of the program has long-run effects on earnings. Also, Carneiro and Ginja (2014) discovered prolonging long-term benefits of Head Start program participation. Similar evidence of the positive impact of universal child care

has also been observed in the case of Norway. Havnes and Mogstad (2015) investigated the effect of newly introduced large-scale, publicly funded child care in Norway on earnings as adults using the non-linear difference-in-difference. They found that the expansion of child care positively affected the lower and middle parts of the income distribution of adults exposed to the expansion as a child, which implies increased income mobility across generations.

2.3 Ethics of Care

The theoretical basis of equity in universal child care derives from care ethics. The ethics of care starts from the realization that humans begin and end their lives with care. Thus, care is a universal activity for every individual, but its responsibility is hierarchized and imposed differently by gender, status, and race (Tronto, 2014; 마경희, 2010). The consequence of unequal care and the resulting adverse effects from the care gaps or career breaks eventually return to social problems. Hence it is vital to recognize care as a basic human need and the citizens' responsibility (이선미, 2016). Therefore, care needs to be repositioned into the realm of public service (Kittay, 2016) and holds universal and public value (전미양 & 최현임, 2020).

(1) Universality

Universalism is a value-oriented concept that encompasses 'all' (Kidale & Kunhle, 2002), meaning that all citizens have equal rights through the welfare system (Rothstein, 1998; Vabø & Szebehely, 2012). However, due to the increasing notion of what would define as 'universal' in the post-industrial society (Thompson & Hoggett, 1996; Vabø & Szebehely, 2012), nowadays, discussions on universalism conveys eligibility, allocation, and needs assessment (Titmuss, 1976; Anttonen, 2002). Consequently, the evaluation of the universality of social services is measured through questions such as whether a legal status of residency limits the service usage, whether the needs are investigated, and whether there is a sufficient amount of service for the people (Sainsbury, 1991; Stephens, 1996).

(2) Publicness

Publicness is constructed on a public (social) basis, so there are various definitions because the subjects, contents, and scopes vary depending on the time and society. However, it can generally be defined as solving the larger social and economic problems of a bigger population by providing the resource to the people with more needs. Therefore, in order to evaluate publicness, it is crucial to investigate the potential users of the service and the means of actualizing it (serviced contents) (주현정 & 김용득, 2018).

(3) Universality and Publicness in Child Care

Children at the elementary school level need care, but the pressure of caregiving is hierarchized and unequally imposed upon caregivers. Therefore, an institutionalized public child care system must be established (장수정, 2020). The gaps in universal child care bring numerous adverse effects on society. Females often leave their jobs to care for their children (이재희, 2018). Children are left alone and exposed to vulnerable environments (서울시 건강가정지원센터, 2017; 임혜정, 2017). Grandparents are burdened by child care (백경흔 외, 2017). Private education is encouraged as a replacement for child care services (신호정, 2016; 이재희 외, 2017). Last but not least, all of these consequences have the potential to contribute to an aging society with a low fertility rate (고선주, 2012). Therefore, in the long run, a national response to child care services is required as a social investment for the future (류연규, 2013). As mentioned in previous sections, the universality of child care service can be measured by the service user, while the publicness can be evaluated through the service provision.

2.4 Accessibility as a Measure of Spatial Equity

As mentioned in the previous section, the universality and publicness are measured by the targeted users and the service provision for them. Thus, the evaluation of the social services — child care service in this study — intrinsically innates the spatial consideration. Furthermore, public facilities hold significant weight in the allocation because their location dramatically influences the potential users who benefit from the installation (Kirby et al., 1984). Thus, according to Talen and Anselin (1998), evaluating spatial equity is essential and can be done through spatial analysis of service distribution.

Table 1 shows the criteria used by previous literature that evaluate spatial equity in public services. Simply put, the main research question the studies on spatial equity aims to answer is who gets what from where and whether it is socially agreeable (Boyne & Powell, 1991; Smith, 1994).

Table 1. Criteria for Spatial Equity in Public Service

Category	Measurement
Equality	Equal service benefit for all
Need	Socio-economic characteristics
Demand	Number of service users
Willingness to pay	Availability for service fee

(Source: Crompton & Wicks, 1988; Marsh & Schilling, 1994; Talen, 2011; Truelove, 1993)

Accessibility is an effective index to represent the level of spatial equity for public services. According to Gulliford et al. (2002), accessibility consists of two concepts which are “having access” (availability of the service) and “gaining access” (availability of resources to overcome barriers to utilizing the service). In other words, accessibility indicates not only the amount of service available in the region (Hansen, 1959) but also the level of effort, whether it be time, distance, or stereotypes, an individual needs to put in order to reach the point of supply (Lau & Chiu, 2003).

For universal after-school child care, analyzing the accessibility of child care services in the region will allow the evaluation of the current limitation of the service provision and the suggestion for further intervention to fill in the gaps in the service usage.

2.5 Significance of the Study

The review of previous literature on universal child care and accessibility measure in spatial equity suggests a point of convergence for child care services and their accessibility to achieve spatial equity of social services. However, despite the rising importance of the universal child care service and the integration of accessibility in public service analysis, especially in the health care field (Ahmed et al., 2019; Hawthorn & Kwan,

2012; Kim et al., 2018; Luo & Wang, 2003; Tanser, 2006), there lacks research that applied accessibility analysis for the child care services.

In Korea, studies on universal child care are divided into theoretical research on defining the realm of universal care (한국노동연구원, 2020; 이선미, 2016; 윤자영, 2018; 마경희, 2020; 김효정·권혁주, 2013; 주현정·김용득, 2018) and the practical research primarily published in the form of a government report on how to implement the care policies (전미양·최현임, 2020; 한지영, 2016; 이혜숙·이영주, 2018; 김은정·장수정, 2020; 서울시여성가족재단, 2019). There is a limitation in these previous studies since they based their results on previous literature and basic statistical data. In order to calculate the supply and demand of care services and to discuss the universality and publicness accordingly, a spatial analysis takes microscopic approaches, that is, the detailed analysis of the child care service accessibility in the specific areas with the targeted population, the children.

Currently, there is a lack of studies that calculated the distribution of child care facilities using spatial analysis methods. There is research that conveys child care accessibility (Seoul Metropolitan Government, 2020; 김정현 외, 2015), yet they used the rudimentary method of calculating the total number of suppliers over the population, which method can yield serious over and under estimation of the service availability in a region. 이지원 외. (2019) used spatial analysis for elementary child care services, yet their study

surveyed only a single district within Seoul and derived an optimal location from all child care facilities, including kindergartens and day care centers.

Therefore, the significance of this study lies in bringing together two topics from different disciplines, universal care and accessibility, and obtaining findings and suggestions that could be tackled in the planning field and potentially improve equity in society.

Chapter 3. After-School Child Care Policy in Korea

3.1 Child Care Policy Change

In 2020, Korea had 272,400 newborn babies and a total fertility rate of 0.84, which marked the lowest since 2000. However, the low fertility rate is a severe and persistent issue in Korea, so the Korean government has been taking action by launching the Low Birth and Aging society Committee in 2005, enacting the Low Birth and Aging Society Basic Act, and establishing the first Basic Plan for Low Birth and Aging Society in 2006, setting key goals, implementation directions, tasks, and contents every five years. In 2021, the Low Birth and Aging Society Basic Plan announced the fourth plan, which is distinguished by the government's active response to the low birth rate with child care support through the establishment of a care policy that emphasizes universality and publicness.

With the increased child care demand in recent generations and the implementation of work-family balance policies and care support policies, child care support has gradually expanded from low-income families (Hilgeman & Butts, 2009; Rossin, 2011; 김인경, 2017; ⓧ삼식 외, 2010; 서문희 외, 2016). The universal care policy, which began with the revision of the Infant Care Act and the Child Welfare Act in 2004, was further developed

in 2018 and 2019 to be integrated and systematic through the "all-day care policy" and the "inclusive state child policy." Under these policies, the Korean government is expanding national responsibility for children and establishing universal care services, expanding a tight community-centered care system, and forming a care consultative body.

However, compared to the ones for children before school age, the care services for elementary children are still limited and insufficient. As of 2018, public care for the early child covered 75.5% of all children, while only 12% of children in elementary school were supported. Therefore, the 'full-day care system' aimed to supply public care services to 530,000 elementary school students expanding the service to cover 200,000 more than the original 330,000 child capacity and investing 356 billion Won in building 1,817 new 'Together Care Centers.' Nevertheless, critics have claimed that care services for elementary school students still exhibit limited practice of universal care (전미양 & 최현임, 2020; 김은정 & 장수정, 2020).

In the case of elementary care services, there are mainly three different types of facilities – Elementary Care Class, Community Child Care Center, and Together Care Center – each supported by separate governmental bodies, resulting in irregular quality of service and an overlapping service area within regions. Moreover, because of the significantly low supply, the care services merely cover the children in disadvantaged backgrounds. To accelerate the

supply, the government planned to build 1,817 Together Care Centers by 2022, but as of 2021, there were only 429 centers, suggesting a lack of political viability.

3.2 After-school Child Care Facilities in Korea

Table 2 shows the characteristics of three major after-school child care facilities in Korea. Community Child Care Centers started the earliest among the three facilities, dating back to the 1970s. However, in 2004, with the revision of the Infant Care Act and the Child Welfare Act, Community Child Care Centers were institutionalized together with the Elementary Care Class. On the other hand, the Together Care Centers are a recent addition to the care facilities, which were institutionalized through the all-day care policy in 2018.

The facilities aim to provide child care services, especially at the elementary school level. However, there is a slight difference in concentration among the facilities. For instance, the Community Child Care Center emphasizes its function of protecting children in vulnerable conditions. On the other hand, the Together Care Center aims to provide flexible care services with easy registration. Unlike Community Child Care Centers and Together Care Centers, Elementary Care Classes are the school care. However, as can be seen from Table 2, they provide similar services, and because there is a limited child care services availability, users tend to use the

services to which they have access (김은정 & 장수정, 2020; 유해미 외, 2018; 정설희, 2021).

For the operation, all of the three facilities run on a bottom-up approach. For Community Child Care Centers, an individual who desires to open the facility must report to the government. Once the facility passes the safety requirement, it receives the operating fee based on the size of the child's capacity¹. With Together Care Centers, technically, a local government has to operate the facilities, and the local government has the freedom to entrust the service to social welfare corporations and non-profit corporations. Thus, most of the services are run by the entrusted corporations. With Elementary Care Classes, its care service is not based on law. Instead, it only appears in the general introduction to the elementary and secondary curriculum (Ministry of Education No. 2015-74). Thus, operating the care classes cannot be mandated yet solely decided by the school steering committee.

With the hours and fees, each service provider is flexible. For example, although Community Child Care Centers and Together Care Centers generally operate in the afternoon while Elementary Care Classes operate in the morning before schools start, some schools also run afternoon and dinner care for their students. With the service fee, Community Child Care Centers

¹ Though, it has been reported that the fees barely cover the payment for the workers and are not enough to cover the rent (김치영, 김설희; 2014)

and Elementary Care Classes should be free in principle, while Together Care Centers cost a little. However, it is also up to the service providers to decide whether to require some service fees or not.

Table 2. Three Main Universal Child Care Facilities in Korea

(Source: 2021년 지역아동센터 지원 사업, 2020 다함께 돌봄사업 안내, 2021년 서울 초등돌봄교실 운영 길라잡이)

	Elementary Care Class (초등돌봄교실)	Community Child Care Center (지역아동센터)	Together Care Center (다함께돌봄센터)
Start	2004	1970s (unofficial), Institutionalized in 2004	2018
Definition	Care activities other than regular classes for students in need of care in a space equipped with separate facilities (exclusive or combined classes, etc.)	Facilities that provide comprehensive child welfare services for the sound development of children, such as the protection and education of children in the community, the provision of sound play and entertainment, and the connection between guardians and the local community	Facilities established and operated by the Si/Do Governor and the head of the Si/Gun/Gu to provide care services for hours other than regular education in elementary schools
Base Law	General Introduction to Elementary and Secondary Curriculum (Ministry of Education No. 2015-74)	Articles 50 to 52 and 54 to 75 of the Child Welfare Act	Article 44-2 of the Child Welfare Act
Administration	Ministry of Education	Ministry of Health and Welfare	Ministry of Health and Welfare
Users	The primary target shall be 1st to 4th graders of elementary school, but it shall be operated autonomously in consideration of demand and conditions	Children under the age of 18 attending elementary and middle schools	Children aged 6 to 12 (elementary school students) who need care
Provider	The head of a school shall be operated after deliberation by the School Steering Committee after the organization of a dedicated department and the establishment of a plan for the placement of care specialists	National or local governments Individuals and must report to the head of the Si/Gun/Gu	The basic principle is to operate the direct management method of local governments, but can be entrusted (social welfare corporations, non-profit corporations, non-profit private organizations)
Hours	Morning care: before class Afternoon care, after-school care class: 13:00~17:00 Dinner care: 17:00~ Morning care during vacation: 09:00~13:00	5 days a week (Monday to Friday), 8 hours a day or more Mandatory Hours During School Days: 14:00~19:00 During Vacation: 12:00~17:00	Regular care / temporary care 5 days a week (Monday to Friday), at least 8 hours a day (including standard service hours). In principle, it is always operated except for holidays. Vacation is not possible Standard hours During school days: 14:00~19:00 During vacation: 09:00~18:00
Fee	Free	< 5,000 won per day, <100,000 won per month	free

Chapter 4. Spatial Accessibility of After-School Child Care Facilities

4.1 Methodology

The first objective of the study is to measure the spatial accessibility of after-school child care facilities across the study area. Accessibility is a concept that accounts for not only physical accessibility (having access) but also service availability (gaining access) because living close to a service provider is different from being able to use the service (Gulliford et al., 2002).

In addition, there exist financial or socio-cultural barriers a user has to overcome in order to gain access. Additionally, if a service is highly competitive as the child care facilities in this study, a supply and demand ratio should also be taken into account because a user's access to a service is highly dependent on that of other users.

In this study, since Korean after-school child care services follow a universal model with significant expenditure from the government and little from the household, physical accessibility (a child's walking distance to service) and local competition (maximum potential users within the service area over available seats) are two main factors for accessibility estimation.

1) Spatial Accessibility Models

Estimating the accessibility of services is frequently practiced in health care studies and the regional availability model, gravity models, and the kernel density model are three prevalent methods in use (Table 3). The regional availability model measures the level of local competition for a service through the demand-to-supply ratio (Joseph & Phillips, 1984). Its simple and inexpensive calculation allows a fast understanding of general service availability in a region. However, it can yield inaccurate estimation since the model is built on the assumption that every user within a census tract has equal access to the service regardless of their location of residence and only utilize the service within the tract (Joseph & Phillips, 1984; Makuc et al., 1991).

Table 3. Three Common Accessibility Methods

Methods	Description	Problem
Regional Availability Model (Joseph & Phillips, 1984; Khan, 1992)	An area's sum of service capacity to the population demand	Individuals within the census tract have equal access to service facility, unable to calculate cross boundary usage
Gravity Model (Joseph & Bantock, 1982)	Sum of impedance-weighted supply to demand ratios of nearby sites	Costly and not intuitive to interpret
Kernel Density Model (Silverman, 1986; Guagliardo, 2004)	Calculation of supply and demand using a kernel function	Underestimation of supply, volatile accessibility ratios, relative interpretation

In contrast to the regional availability model, the gravity model modified Newton's law of gravitation and took the distance decay effect² into its equation by introducing the travel-friction coefficient. Initially proposed by Hansen (1959), the model was improved by Weibull (1976)³, then applied by Joseph and Bantock (1982) as a method to assess health care accessibility. The basic gravity model can be written as below.

$$A_i = \sum_{j=1}^n \frac{S_j f[\text{Dist}(i,j)]}{\sum_k^m P_k f[\text{Dist}(k,j)]}$$

A_i : gravity-based spatial accessibility for location i

S_j : supply capacity of site j

P_k : population of location k

$\text{Dist}(i,j)$: travel cost from i to j

n : total numbers of supply sites

m : total number of population locations

There are variations to the model depending on the travel-friction coefficient functions $f(d)$. The inverse-power ($f(d) = d^{-\beta}$), the exponential ($f(d) = e^{-\beta d}$), the Gaussian ($f(d) = e^{-d^2/\beta}$) are the most common functions in use (Kwan, 1998). In contrast to the regional availability model, the gravity model is superior since it introduced the distance decay effect and cross-boundary behaviors in its equation. However,

² A distance decay effect is when people become less willing to travel as the distance increase. The effect forms the basis of Tobler (1970)'s first law of geography.

³ Hansen's model only accounted for the supply side. Thus, Weibull introduced a measure to represent competition for service among nearby residents.

it is less intuitive to interpret its results (Luo & Qi, 2009), and the model requires extensive data inputs and onerous multi-level computation.

The kernel density model is a variant of gravity models which employs the Gaussian kernel function in the gravity model to create a surface of the predicted distribution of service across the study area. In this model, the density of each cell within the study area is calculated, and each point of supply is represented as a cone (kernel) of which the volume reflects the supplier's capacity. The main strength of the kernel density method is that it is offered by GIS software such as ArcGIS' kernel distribution function estimation, thus is readily available to researchers who aim to measure spatial accessibility of certain services. However, choosing an optimal bandwidth and the radius of a provider's potential service area entails a subjective decision, and the model can yield unrealistic results with an extreme case of disparity where the most under-serviced area locate right next to the most over-serviced area. In addition, with the kernel density method, the results are a relative accessibility score compared to the rest of the tracts in the region (Yang et al., 2006).

2) 2SFCA (Two-Step Floating Catchment Area) Method

The two-step floating catchment method (2SFCA) is a particular case of the gravity model, first introduced by Radke and Mu (2000), then further

developed by Luo and Wang (2003)⁴. The model overcomes the previously enlisted spatial accessibility models. First, it features the interactions between providers and users across administrative boundaries by calculating the supply-demand ratio within catchments (travel-time service area) of users. Then, its results are straightforward and intuitive. The scores can be directly interpreted as the number of available providers or openings over the demand population. The 2SFCA method is frequently used in a number of studies across academic fields (Chen & Jia, 2019; Fransen, 2015; Kanuganti et al., 2016; Langford et al., 2012; Xiao et al., 2021) and has been modified and enhanced to feature geographical impedance and local competitiveness into the model accurately (Bryant Jr & Delamater, 2019; McGrail, 2012; Wang, 2021; Xing et al., 2020).

The 2SFCA method calculates the accessibility score in two steps. In the first step, a supply-to-demand ratio is calculated in each supply point. Here, a catchment is drawn from each supply point following the pre-determined travel time or distance, and the population in every census tract within this catchment is calculated as the demand. The equation of the first step can be written as below.

⁴ Radke and Mu (2000) used buffers (centroids) for the catchment shape, while Luo and Wang (2003) used the street data to derive the service area by travel distance or time.

$$R_j = \frac{S_j}{\sum_{k \in \{d_{kj} \leq d_0\}} P_k}$$

P_k : Population at location k (all population locations)
 S_j : Supply Capacity at location j (supply catchment area)
 d_{kj} : Travel distance between k and j
 R_j : Provider-to-population ratio at location j

In the second step, if a centroid of a census tract has catchment overlapped, the supply-to-demand ratio from each overlapped facility is summed up to yield a final accessibility score. The equation of the second step can be expressed as below.

$$A_i^F = \sum_{j \in \{d_{ij} \leq d_0\}} R_j$$

A_i^F : Accessibility of supply at a given location i
 R_j : Provider-to-population ratio at location j
 d_{ij} : Travel distance between i and j

An illustrated example of Figure 1 demonstrates how the 2SFCA accessibility score is measured. Here, the first step of 2SFCA is to sum up the population of census tracts within the catchment, which is [1, 2, 3, 4, 6, 7, 9, 10] for facility A and [4, 5, 8, 11] for facility B⁵. Suppose the supply capacity

⁵ Note that even though tract 10 is included in the catchment of facility B, because its centroid is outside the catchment, the population of tract 10 does not constitute a demand for facility B.

of facility A is 4, and the total population of tracts [1, 2, 3, 4, 6, 7, 9, 10] is 40. Then, the provider-to-population ratio of facility A is 1/10, which is the accessibility score given to Then, for the second step of 2SFCA, since the catchments of facility A and facility B overlap on tract 4's centroid, the provider-to-population of facility A and B need to be summed up to give tract 4 a new accessibility score. For example, suppose facility B has a ratio of 1/5. Then, tract 4's final accessibility score is 3/10.

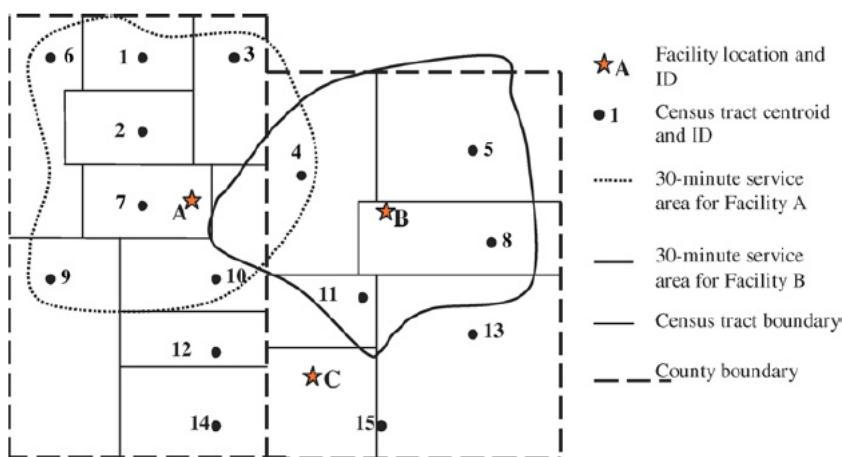


Figure 1. Illustrated Example of 2SFCA Method
(Source: Yang et al., 2006; adapted from Luo & Wang, 2003)

3) 2SFCA Model for the Study

This study utilizes the 2SFCA method to measure child care accessibility across the study area. Because there are three types of after-

school child care facilities with different governing bodies and social connotations but similar purpose and function, an area's access to each type of child care facility is measured separately. However, as the study seeks to discover areas with low access to universal child care, meaning any publicly funded child care service regardless of the type, another accessibility score is estimated so that all three child care facilities are grouped as the supply of 'universal child care.' The 2SFCA equations for the study are:

(1)

$$R_j = \frac{S_j}{\sum_{k \in \{d_{kj} \leq d_0\}} P_k}$$

(2)

$$A_i^F = \sum_{j \in \{d_{ij} \leq d_0\}} R_j$$

P_k : Population at location k (all population locations)

S_j : Number of seats at child care facility location j (catchment area j)

d_{kj} : Travel distance between k and j

A_i^F : Accessibility of child care facility at population location i (catchment area i)

R_j : Child care seats to child population ratio at facility location j

d_{ij} : Travel distance between i and j

In this study, the number of seats (openings) in after-school child care facilities is used as the supply capacity, and the population of elementary school students represents the demand. The catchment distance is 500m⁶ measured in a road network.

⁶ In his Neighborhood Unit Theory, Perry (1929) suggested an acceptable walking distance for children to be approximately 1/4 miles (400m). In Korea, the Neighborhood Unit Theory has served as a basis for the allocation of schools and residential zones (백혜선, 2008).

4.2 Data

1) Data Collection

The Geodatabase, supply, and demand data are needed to execute the 2SFCA model. The data collected for the accessibility analysis are listed in Table 4.

Table 4. Data Source

Data	File Name	Year	Source	Type
Geodatabase				
Street	Continuous Topographic map (연속수치지형도)	2022	Ministry of Land, Infrastructure and Transport National Geographic Information Service (국토지리정보원)	Line
Dong Boundary	Census Geospatial Information Design (센서스 공간정보 설계서)	2022	Statistics Korea	Polygon
Gu Boundary			Space Information Service Division (공간정보서비스과)	
Supply				
Elementary Care Class	2021 2nd Semester All-Day Care (Elementary Care) Facilities (2021 학년도 2 학기 온종일돌봄(초등돌봄) 시설 현황)	2021	Ministry of Education	1.Point 2. Seats
Community Child Care Center	Seoul Community Child Care Center Facility Status (서울시 지역아동센터 시설현황정보)	2022	Seoul Public Data Director of Childcare, Women and Family Policy Office	1.Point 2. Seats
Demand				
Elementary School Student Population	National Territory Statistics Population Information (국통계 인구정보)	2021	Ministry of Land, Infrastructure and Transport National Geographic Information Service (국토지리정보원)	100m x 100m cells

2) Data Processing

Using ArcMap 10.5, the geodatabase data are first imported as the base map. Then, the geocoded supply data were combined with the base map. The demand data were already in a shape file format with the population stored in the cell polygons. Thus, no further action was required during the data import.

After bringing in all the data, Feature to Point tool was used to plot a centroid in each population cell, and Network Analyst's Service Area Analysis was used to draw catchments. Then, the Spatial Join tool was used to calculate 2SFCA accessibility scores distributed across the cells.

3) Descriptive Statistics

Table 5 shows the descriptive statistics of the data used in the analysis. In Seoul, there are 465 Dongs in 25 Gus, and the area of Seoul consists of 64676 100m by 100 geodata cells. Out of 64676 cells, 46691 (72.2%) are populated by 396722 people. Among the three public after-school child care suppliers, the Elementary Care Class offers the largest number of facilities and seats.

Table 5. Descriptive Statistics of Data Used in the Analysis

Geodatabase			
Count			
Dong			465 ⁷
Gu			25
Supply			
Facility #		Seat #	Seats per facility
Elementary Care Class		576	31892
Community Child Care Center		447	13654
Together Care Center		128	3257
Demand			
Cell (total)		Cells (with population)	Total Population
Elementary School Student Population (100m x 100m cells)		64676	46691
			396722

4.3 Results

1) Child Care Service Accessibility

In the study area, among 64646 cells, 15340 cells (23.7%) fall within the catchment of Elementary Care Classes, while 14608 cells (22.6%) are within Community Child Care Centers and 5427 cells (8.4%) for Together Care Centers (Table 6). While the number of cells covered by the catchment

⁷ In 2021, Sangil-dong was split into Sangil 1-dong and Sangil 2-dong. Therefore, as of 2022, there are 466 dongs in Seoul. However, because there are data dated prior to this administrative change, this study merged Sangil 1-dong and Sangil 2-dong to Sangil-dong to match the older data.

of care class and Community Child Care Centers is relatively similar, there is a remarkable decline in the number of cells in the Together Care Center's catchment areas. However, when counting cells that have fallen under the catchment of at least one care facility type, there is an increase in the number of cells and the coverage ratio. This increase represents a situation where each facility type covers different parts of the study area. In fact, if the areas of the catchment were overlapped, the number of cells for total care facilities coverage would have been similar to care class which has the most extensive service coverage.

Table 6. Cells Within Child Care Catchment

	Elementary Care Class		Community Child Care Center		Together Care Center		Universal Child Care	
Cells Within Catchment	N	%	N	%	N	%	N	%
	15340	23.7	14608	22.6	5427	8.4	21015	32.5

Figure 2 shows the catchment area of each facility type across the study area. Since the number of Elementary Care Classes is the highest, the catchment area of care classes extensively disperses across the study area. However, the catchment area of Community Child Care Centers and Together Care Centers are less distributed, exhibiting a considerable absence in districts with a high level of socio-economic status (Gangnam-gu and Seocho-gu – located in the southeast region).

Also, supplementing the finding from Table 6, Figure 2 demonstrates the distinct spatial distribution of Community Child Care Centers and Together Care Centers. Though most of their allocation parallels with that of the care class, there are areas where they fill in the marginal space between care class catchments. Such allocation is especially prominent in Eunpyeong-gu, Seodaemun-gu, and Gangdong-gu for Community Child Care Centers, and Dobong-gu, Nowon-gu, and Guro-gu for Together Care Center, which are highlighted in red dotted circles in the figure.

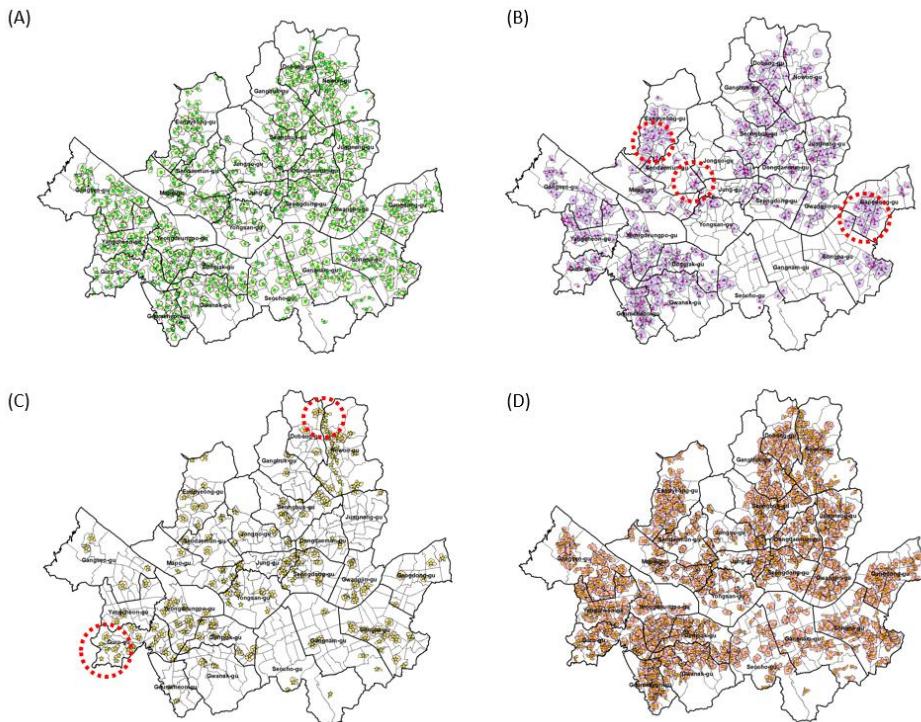


Figure 2. After-School Child Care Catchment Area
 (A: Elementary Care Class, B: Community Child Care Centers, C: Together Care Center,
 D: Universal Child Care)

However, solely counting on the number of cells to assess the service area can cause over or under-estimation of accessibility because there are cells without residents. For instance, a region with a larger area covered by mountains or rivers can have an unrealistically lower accessibility score. Therefore, it is crucial to set aside any cells with zero population.

Table 7 shows the descriptive statistics of after-school child care accessibility after dismissing cells without population. While Elementary Care Classes still hold the highest number of cells within its catchment, it can be observed that canceling out the invalid cells significantly decreased the ratio of child care service coverage. The finding from Table 7 that only 24.9% of the study area have child care services available for them within walking distance. The other 75.1% either do not have nearby child care services or their children have to travel further to reach any child care services.

Table 7. Descriptive Statistics of Cell-Level Child Care Accessibility (Without Invalid Cells)

	N	% ^a	Mean	Std	Min	Med	Max	Range
Elementary Care Class	7489	16.0	0.187	0.164	0.011	0.104	2.571	2.56
Community Child Care Center	6476	13.9	0.133	0.153	0.017	0.148	7 ^b	6.983
Together Care Center	2882	6.2	0.084	0.093	0.009	0.06	1.473	1.464
Universal Child Care	11610	24.9	0.215	0.204	0.009	0.168	7	6.991

^a The number of cells with population (46691), was used for a denominator for the ratio.

^b Although this is abnormally high for an accessibility score indicating that there are 7 seats available for one child, the author has reviewed and confirmed that there wasn't a computational nor calculational error during the process.

Additionally, the descriptive statistics reveal significant gaps between cells within the catchment. For example, the maximum accessibility score of every facility type exceeds one, revealing that certain parts of the study area have greater child care services available for the local child population⁸. Also, Figure 3 exhibits that the accessibility scores are right-skewed, indicating that most cells are clustered towards lower values while there are extreme outliers with higher values.

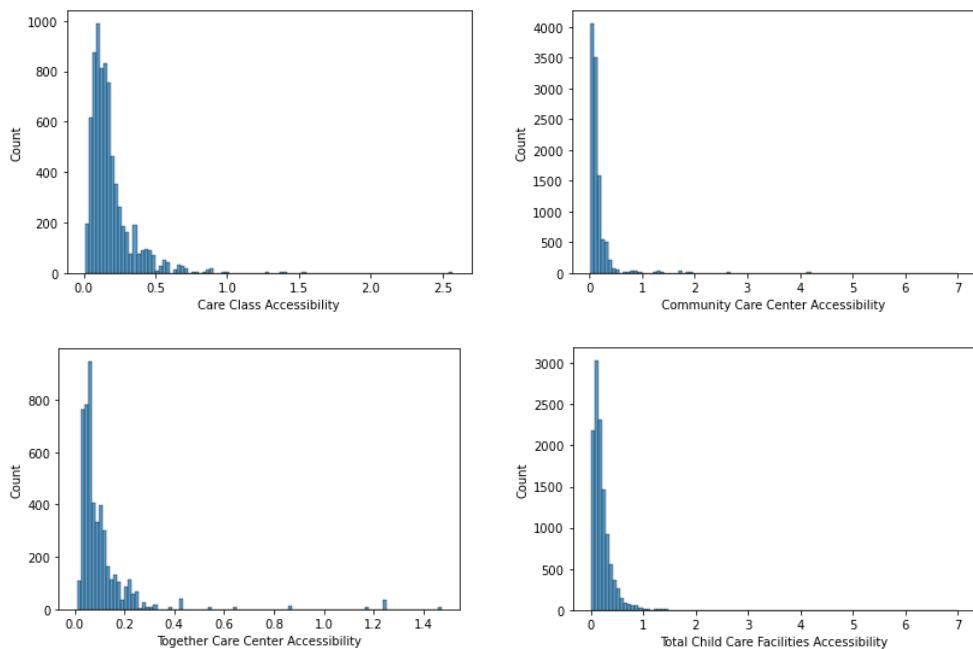


Figure 3. Histogram of Child Care Accessibility by Types

⁸ However, because there is a persistent child care service shortage in Korea, it is more reasonable to interpret this high number as certain facilities' inappropriate allocation causing a higher supply than the local demand.

2) Spatial Distribution of Child Care Service Accessibility

a) Elementary Care Class Accessibility

Figure 4 shows the accessibility scores by facility types across the study area grouped into four quartiles. For the Elementary Care Classes, since the care service takes place within the elementary schools, the location of supply is the same as the elementary school. Hence, the low accessibility score indicates a low number of seats the service offers compared to the surrounding child population size. However, among the spatial distribution patterns of Elementary Care Class accessibility scores, there are some Gu's that stand out due to the pervasiveness of low quartile accessibility.

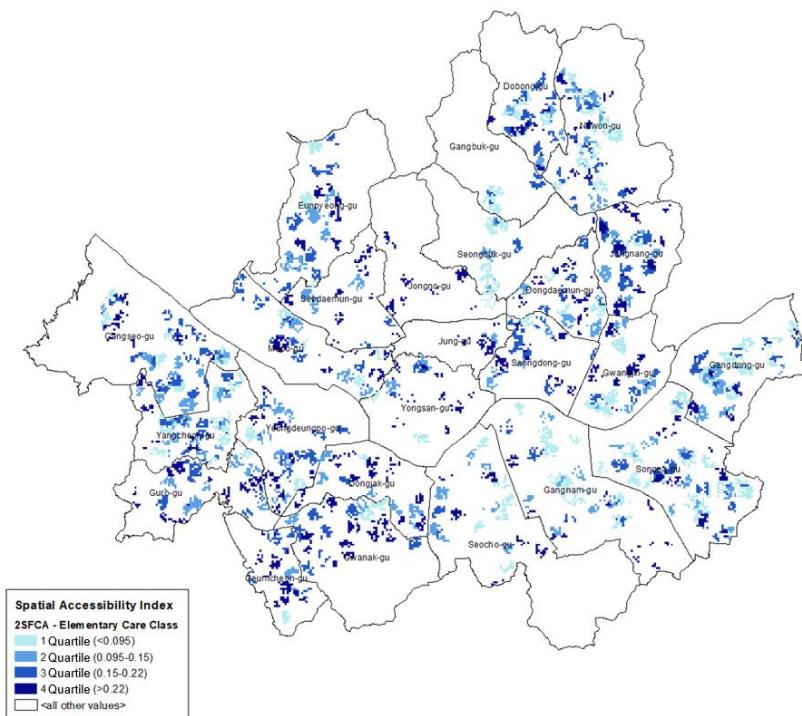


Figure 4. Elementary Care Class Accessibility

Areas in the first quartile of accessibility scores are majorly located in Gangbuk-gu, Gangdong-gu, Nowon-gu, Seocho-gu, Seongbuk-gu, Songpa-gu, and Yangcheon-gu. Among these Gus, the number of private academic institutions by Gu provides a primary possible explanation for why there are larger areas with low accessibility scores. Gangnam-gu, Songpoe-gu, Yangcheon-gu, Seocho-gu, Gangdong-gu, and Nowon-gu are the top six Gus with the largest number of private academic institutions⁹. Thus, these Gus having vast areas with low accessibility scores implies that the frequent use of private academic institutions may have influenced the school's decision to open the small number of seats for their care service. However, this relationship can also be reversed. The scarcity of child care could have increased parents' private academic institution dependency. However, Seongbuk-gu and Gangbuk-gu are unassociated with this relationship. Seongbuk-gu has the 11st largest number of private academic institutions, while Gangbuk-gu ranks 22nd. This disassociation hints that there are other factors contributing to the low accessibility of child care services in these regions. Hence a further investigation is needed.

⁹ According to the Ministry of Education, there were 7,773 private academic institutions in Seoul in 2020. There were 1870 in Gangnam-gu, 988 in Songpa-gu, 976 in Yangcheon-gu, 881 in Seocho-gu, 685 in Gangdong-gu, and 671 in Nowon-gu.

b) Community Child Care Center Accessibility

Figure 5 illustrates the accessibility of Community Child Care Centers across the study area, categorized into four quartile groups. What is noticeable in the Community Child Care Center accessibility map compared to that of Elementary Care Class is that the accessibility displays gradient patterns. For example, in Figure 4, a cell and its neighboring cells are likely to be in the same quartile groups. Thus, there was a stark difference in accessibility levels between each service area group. However, Figure 5 shows higher accessibility scores towards the center of service areas. This difference illustrates the tighter clustering of Community Child Care Centers. In other words, for Community Child Care Centers, although there are some areas without any child care centers, when there is one, it is located proximity to others.

Previous literature attests that Community Child Care Centers started from non-profit study rooms in impoverished parts of a city (강명순 외, 2010; 정의중 외 2009) and are mainly used by children from low levels of socio-economic status (김양이 & 박미란, 2007, 이보람 외, 2018; 정선옥 & 김진숙, 2014, 지역아동센터중앙지원단, 2021). Hence, clustered service areas of Community Child Care Center can be read as a region with many children in need. Therefore, regions where a vast area shares a low accessibility score, such as the ones in Gangdong-gu, Gangseo-gu, and Yangcheon-gu, suggest a

circumstance where there may be several child care centers, yet a limited number of openings available for the local children.

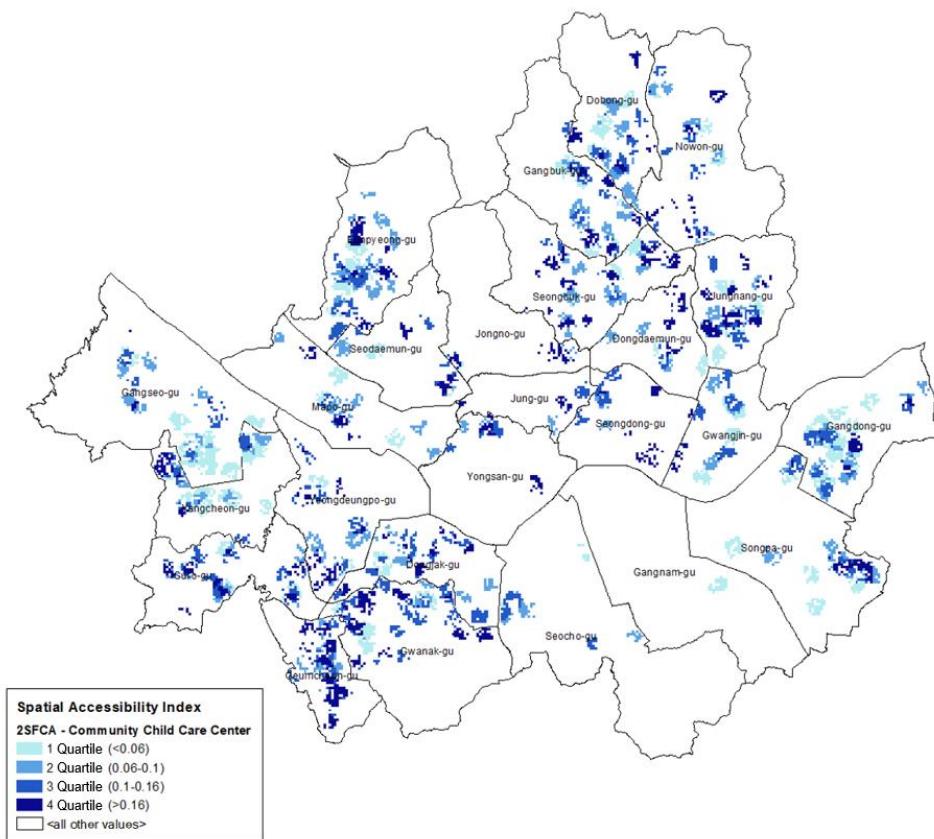


Figure 5. Community Child Care Center Accessibility

c) Together Care Center Accessibility

Figure 6 exhibits a spatial pattern of Together Care Center's accessibility across the study area. Unlike Elementary Care Classes and Community Child Care Centers, distinctive spatial patterns or characteristics cannot be found. Although there is a difference in the number of facilities by

Gu, every Gu's Together Care Center service area has accessibility scores fairly distributed across the quartiles.

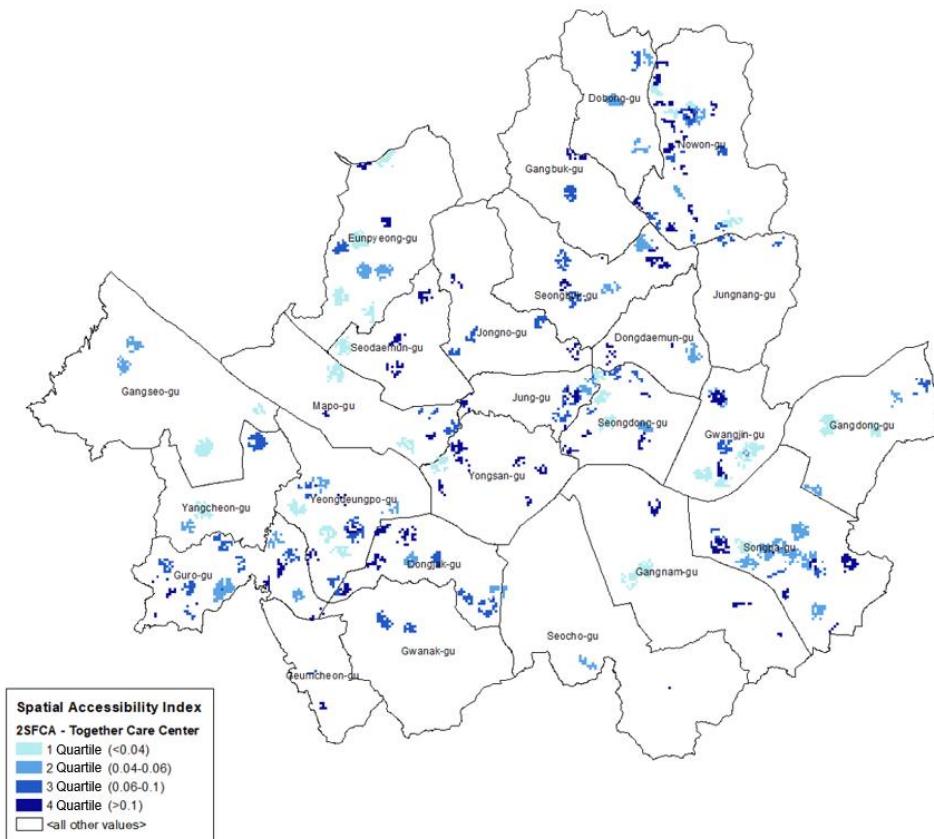


Figure 6. Together Care Center Accessibility

d) Universal Care Accessibility

Figure 7 shows the accessibility of universal child care. The figure is instrumental in elucidating universal child care deficit areas in Seoul. An area's universal child care accessibility score is categorized into four quartiles. Then, among the areas without accessibility scores, two different characteristics are identified and represented contrastingly. First, there are

areas without any child population, and they are marked with dotted patterns in the figure. These are the areas where the absence of accessibility is out of concern. On the other hand, there are areas with a child population yet devoid of any available child care services. There are the areas that raise an issue to child care availability across the study area. In the figure, they are colored red¹⁰.

There are four types of spatial patterns in universal child inaccessibility:

- A. Areas where child care accessibility and inaccessibility are set apart.
- B. Areas that do not have accessibility scores due to their long distance from child care facilities. Considering that the analysis was done on 100m x 100m cells, these areas are the least problematic types of child care inaccessibility as a child could still reach the service by exceeding their acceptable walking distance.
- C. Areas where the child population resides only in a minor part of the region, scattered apart from one another. This can be a scenario where the child population is relatively insignificant in the region and installing a child care facility may seem excessive.

¹⁰ The names of Dongs are not included in the figure to display more apparent results. See appendix for Dongs' Korean and English names and the location.

D. Areas where an area with child care inaccessibility is surrounded by areas with accessibility. These areas point towards a situation where a particular part of a region is mainly segregated in the child care landscape. Type D could be the combined result of type A and B where the areas are outside the acceptable child's walking distance range from a child care facility in addition to the absence of the service facility in the broader part of the region.

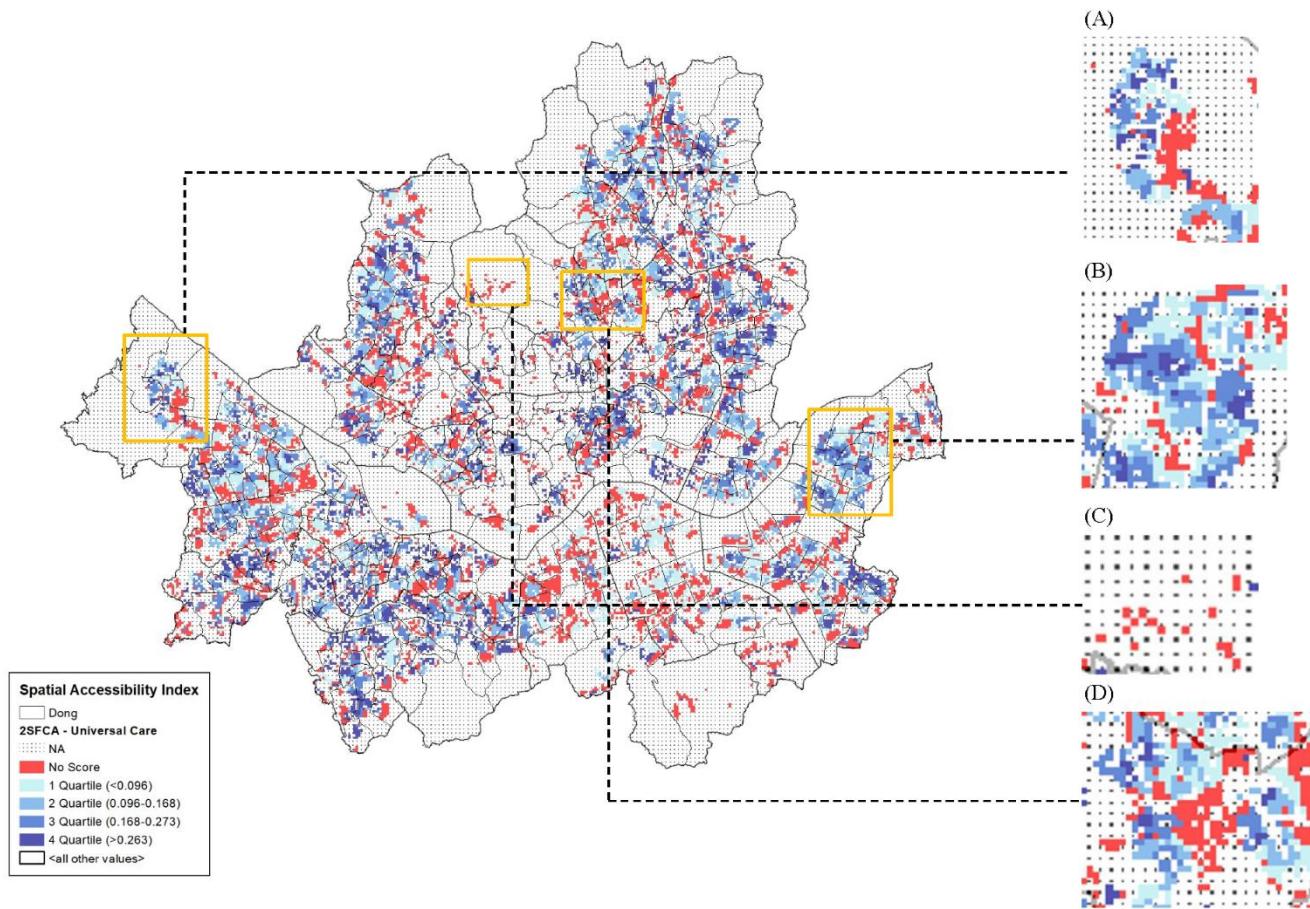


Figure 7. Universal Child Care Accessibility

Chapter 5. Regional characteristics associated with Child Care Accessibility

5.1 Methodology

The second objective of the study is to investigate the socio-economic characteristics of the areas with oversupply or undersupply of after-school child care services. As discussed in the previous chapter, child care usage is especially effective for children from disadvantaged backgrounds, which can work to reduce inequalities among children (Baldridge et al., 2017; Brandon, 2004; Drange & Telle, 2018; Durlak et al., 2010; Havnes & Mogstad, 2015; Laurin, 2015; Vandell & Shumow, 1999; Zimmerman et al., 2017; 김선숙 & 임세희, 2020). Therefore, it would be desirable if more child care services were offered and accessible in an area of need. However, due to the absence of planning regulation that mandates the installation of child care facilities and the intrinsic nature of a bottom-up organization, it is unsure if the allocation of service accessibility parallels with the regional characteristics. Additionally, a lack of research on spatial analysis adds another layer to the opaqueness in the child care landscape in Seoul.

Therefore, in this chapter, using socio-economic data, a relationship between regional characteristics and child care accessibility is investigated. The analysis takes place in two parts.

First, accessibility scores of 100m x 100m cells are aggregated into a Dong because socio-economic data are only available at the Dong level. Thus, accessibility scores at the cell level must be aggregated to produce the Dong level child care accessibility. The average accessibility in the cells within a Dong is used for the estimation. Additionally, to avoid underestimating accessibility scores caused by uninhabited areas, the sum of cell level accessibility scores was divided by only the number of cells with population.

Secondly, the accessibility of each facility type at the Dong-level is grouped into four quartiles¹¹ and the missing value. Then, the descriptive statistics of socio-economic variables of Dongs is used to compare the regional characteristics associated with over and undersupply of child care services.

Lastly, to investigate the extent of the relationships between regional characteristics and child care accessibility, an OLS analysis is employed. In this analysis, the child care accessibility score from the 2SFCA analysis is set

¹¹ It is best to use a socially compromised value to distinguish over-and under-supply. However, since the current accessibility of child care in Seoul is too low to be compared with the demand population from the national survey, the study used quartiles to indirectly deduce over- and under-supply areas (According to a yearly survey on after-school child care demand, 51.3% of parents with elementary school students responded that they want to use the public after-school child care services). (Source: 22년도 범정부 온종일돌봄 수요조사 결과, 교육부)

as a dependent variable while distinguishable regional characteristics variables between quartile groups are placed as independent variables.

5.2 Data

1) Data Collection

Table 8 is the list of the data that were used for the Dong-level accessibility analysis. In this study, the main determinants of accessibility scores were the supply-to-demand ratio and allocation of the service. Therefore, data that are closely related to these determinants were selected for the analysis. First, to depict the demographics of the residents, data on population density, household size, average age, and total and child population were used¹². Then, data on National Basic Living Security recipients, housing types¹³ and price¹⁴ were employed to represent the economic status of the residents. Lastly, land price data was utilized to account for attributes that could influence the installation and allocation of public services. All the data are provided at the Dong level.

¹² To make the variables more representative of the demand population, data such as education levels and occupations are needed. However, since these data are only provided at a larger administrative level, Gu, this study excluded them from the analysis.

¹³ In Seoul, apartments have the highest price per size among the four housing types (Average housing price per size(10,000 Won/m²): Multi-Units A (단독다가구) = 757.3; Apartments (아파트) = 1055.9; Multi-Units B (연립 다세대) = 645.7; Commercial Complex (오피스텔) = 752.5) (Source: Seoul City Planning Bureau)

¹⁴ Because it is impossible to get the income data at a Dong-level, this study used housing prices instead to represent the income level of the residents.

Table 8. Original Socio-Economic Data

Data	File Name	Year	Source	Unit
Population Density	서울시 인구밀도 (동별) 통계	2022 ¹⁵	서울특별시 스마트도시담당관	Population number / km ²
Household Sizes ¹⁶	서울시 세대원수별 세대수 (동별) 통계	2022	행정안전부「주민등록인구통계」	Household number
Average Age	서울시 평균연령 (동별) 통계	2022	서울특별시 스마트도시담당관	Age
Total Population	서울시 주민등록인구 (동별) 통계	2022	서울특별시 스마트도시담당관	Population number
Child Population				
National Basic Living Security Recipients	서울시 국민기초생활보장 수급자 (동별) 통계	2021	서울특별시 희망복지지원과	Population number
Housing Types	서울시 주택종류별 주택 (동별) 통계	2020	통계청 인구총조사과	Housing unit number
Housing Price	서울시 부동산 실거래가 정보	2022		
Land Price	서울시 개별공시지가 정보	2021	서울특별시 도시계획국 토지관리과	10,000 Won/ m ²

2) Data Processing

Among the collected data, some data are altered to produce optimal findings. Household size, child population, National Basic Living Security

¹⁵ The original dataset was dated 2020. The author modified the dataset using population of 2022.

¹⁶ There are two similar datasets available for household size. This study used '세대원' data instead of '가구원' because it is directly associated with the number of family members.

recipient, and housing types are calculated as a ratio so that the values are taken as the comparative measures between Dongs. Also, for household size and housing types data, the subcategories were too detailed to be grouped into bigger categories (Table 9).

Table 9. Modified Socio-Economic Data

Data	Subcategories	Modification	Unit
Household Sizes	1-Person Household	Small Household / Household Size	Small Household Ratio (%)
	2-Person Household		
	3-Person Household	Medium Household / Household Size	Medium Household Ratio (%)
	4-Person Household		
	5-Person Household	Large Household / Household Size	Large Household Ratio (%)
	6-Person Household		
	7+Person Household		
Child Population		Child Population / Total Population	Child Population Ratio (%)
National Basic Living Security Recipients		National Basic Living Security Recipients / Total Population	National Basic Living Security Recipient Ratio (%)
Housing Types	단독주택	Independent Houses / Total Housing	Independent House Ratio (%)
	다가구주택		
	연립주택	Multi-Units / Total Housing	Multi-Unit Ratio (%)
	다세대주택		
	아파트	Apartments / Total Housing	Apartment Ratio (%)
	영업겸용	Commercial Units / Total Housing	Commercial Unit Ratio (%)

Table 10 shows the list of the variables used in the OLS regression. Due to the skewness and kurtosis of the original data, the log was taken on all the accessibility scores of child care services, the child population, and the National Basic Living Security Recipient Population.

Table 10. Variables used in OLS Regression

Variable	Description
SFCA_total_ln	Log (accessibility score of universal care)
SFCA_cc_ln	Log (accessibility score of elementary care class)
SFCA_comc_ln	Log (accessibility score of community care center)
SFCA_tc_ln	Log (accessibility score of together care center)
lnchild	Log (child population)
lnws	Log (national basic living security recipients)
l_price2	Land price
hprice_r	Housing price
genwc_r	Ratio of medium households + large households
h_c	Ratio of apartments

3) Descriptive Statistics

Table 11 is the descriptive statistics of variables for regional characteristics. Among the data, population, National Basic Living Security recipient population, housing price, and land price are skewed to the right indicating that there are Dongs with extreme values (Figure 8). Additionally, housing types data exhibit unusual distribution where the frequency of

extreme values of multi-units and apartments are opposite from each other while the rest are leveled (Figure 9).

Table 11. Regional Characteristics of Dongs (N=425)

Data	Mean	Std	Min	Max	
Population Density (Population / km2)	23247.45	11515.75	213.43	55411.9	
Household Sizes	Small Households (%)	65.0	12.5	22.9	94.8
	Medium Households (%)	31.0	11.0	4.8	67.5
	Large Households (%)	4.0	1.6	0.4	11.0
Average Age	44.1	2.7	35.2	51.8	
Child Population (%)	4.0	2.2	0.3	19.8	
National Basic Living Security Recipients (%)	4.1	3.0	0.04	23.8	
Housing Types	Independent Houses (%)	3.0	5.2	0	56.7
	Multi-Units (%)	38.3	27.1	0	94.1
	Apartments (%)	55.1	30.0	0	100.0
	Commercial Units (%)	3.3	3.0	0	24.2
Housing Price (10,000 Won/ m2)	918.3	365.4	446.7	2247.9	
Land Price (10,000 Won/ m2)	453.1	280.5	102.6	2503.5	

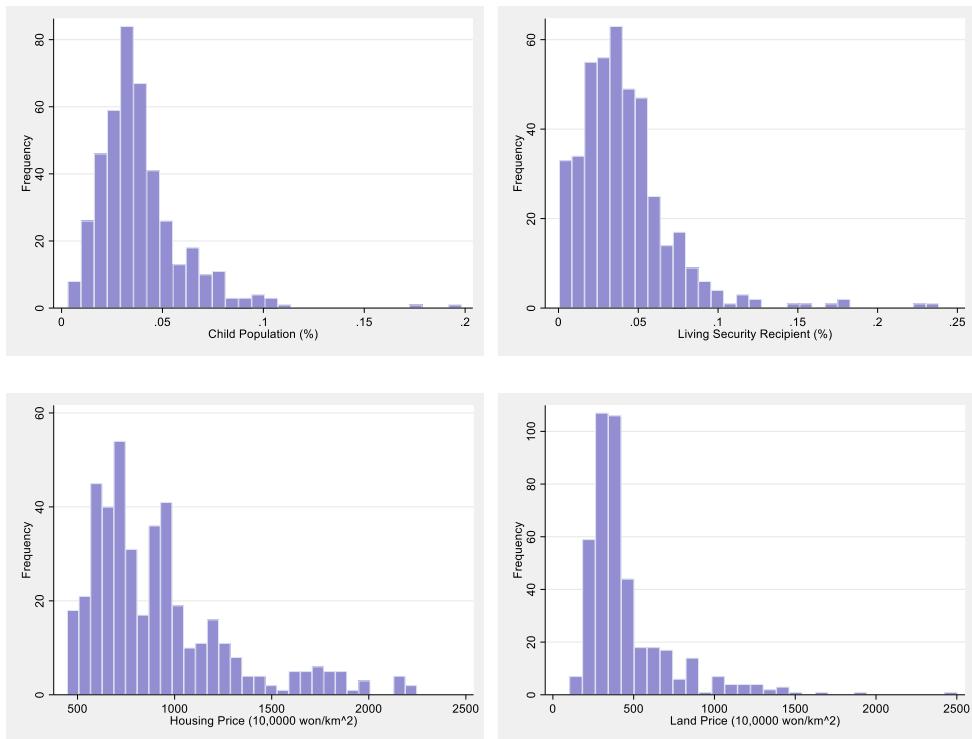


Figure 8. Right-Skewed Data

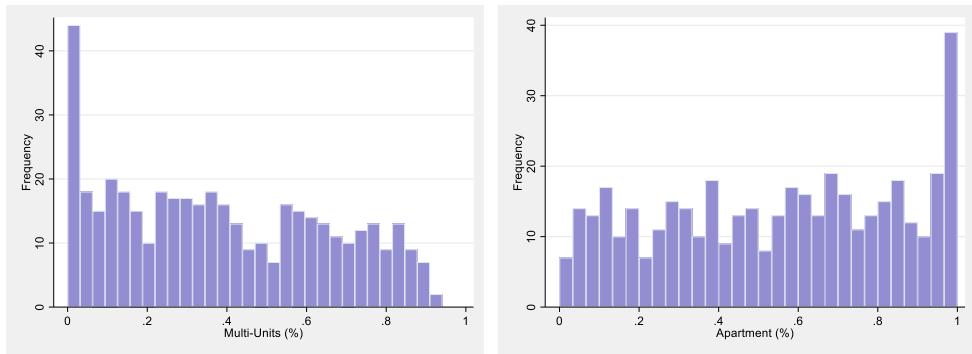


Figure 9. Unusual Distribution of Housing Types

Table 12 shows the descriptive statistics of the variables used in the OLS regression. The correlation analysis was conducted on these variables

(Table 13), and all the independent variables (regional characteristics) showed significant correlation to the dependent variable (accessibility scores).

Table 12. Descriptive Statistics of Variables for OLS Regression

Variable	Obs	Mean	Std. Dev.	Min	Max
SFCA_total_ln	418	-2.11	0.80	-6.91	1.16
SFCA_cc_ln	392	-2.67	0.83	-6.91	0.54
SFCA_comc_ln	332	-3.18	1.12	-6.22	0.39
SFCA_tc_ln	221	-3.97	1.02	-6.91	-1.09
lnchild	425	6.55	0.85	1.79	8.28
lnws	425	6.46	1.04	0.00	8.61
l_price2	425	453.14	280.47	102.61	2503.54
hprice_r	425	918.32	365.39	446.73	2247.86
genwc_r	425	0.35	0.13	0.05	0.77
h_c	425	0.55	0.30	0.00	1.00

Table 13. Correlation Analysis

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) SFCA_total_ln	1.000						
(2) lnchild	-0.447 (0.000)	1.000					
(3) lnws	0.300 (0.000)	0.151 (0.002)	1.000				
(4) l_price2	-0.290 (0.000)	-0.199 (0.000)	-0.466 (0.000)	1.000			
(5) hprice_r	-0.327 (0.000)	0.016 (0.747)	-0.544 (0.000)	0.652 (0.000)	1.000		
(6) genwc_r	-0.484 (0.000)	0.715 (0.000)	-0.331 (0.000)	-0.041 (0.399)	0.263 (0.000)	1.000	
(7) h_c	-0.362 (0.000)	0.461 (0.000)	-0.272 (0.000)	0.085 (0.079)	0.353 (0.000)	0.630 (0.000)	1.000

5.3 Results

1) Elementary Care Class

The Elementary Care Class accessibility at the Dong level is presented in Table 14. Among 425 Dongs, there were 33 Dongs without accessibility. Within the 392 Dongs that have access to Elementary Care Classes, the average accessibility score is 0.093, meaning there are 93 seats available per 1,000 students. The Dong with the minimum accessibility has a score of 0.001, while the Dong with the maximum accessibility has 1.714, 1714 seats available per 1,000 students¹⁷.

Table 14. Dong Level Elementary Care Class Accessibility

	N	Mean	Std	Min	25%	50%	75%	Max
Elementary Care Class Accessibility	392	0.093	0.10	0.001	0.048	0.0785	0.112	1.714

Figure 10 shows the spatial distribution of Elementary Care Class accessibility in Dongs. It is noticeable that the dongs without accessibility and those with low accessibility are adjacent and clustered across the wider region. Considering that the majority of elementary schools (77.4%) that do not operate Elementary Care Classes are private schools (Table 15), the finding suggests that the Dongs without Elementary Care Classes accessibility may

¹⁷ It should be noted that this is an extreme outlier indicating that the schools in this Dong have many students who commute far to get to the schools. The second highest accessibility score is 0.392.

have higher land prices, exhibiting a more favorable regional ambiance. However, more questions arise: what happens to the local children in the Dongs with elementary schools without after-school child care services? Are these children the students enrolled in those schools, or do they travel far to commute to schools on other Dongs? A further investigation is needed to understand the relationship between the children in these areas and their after-school child care usage.

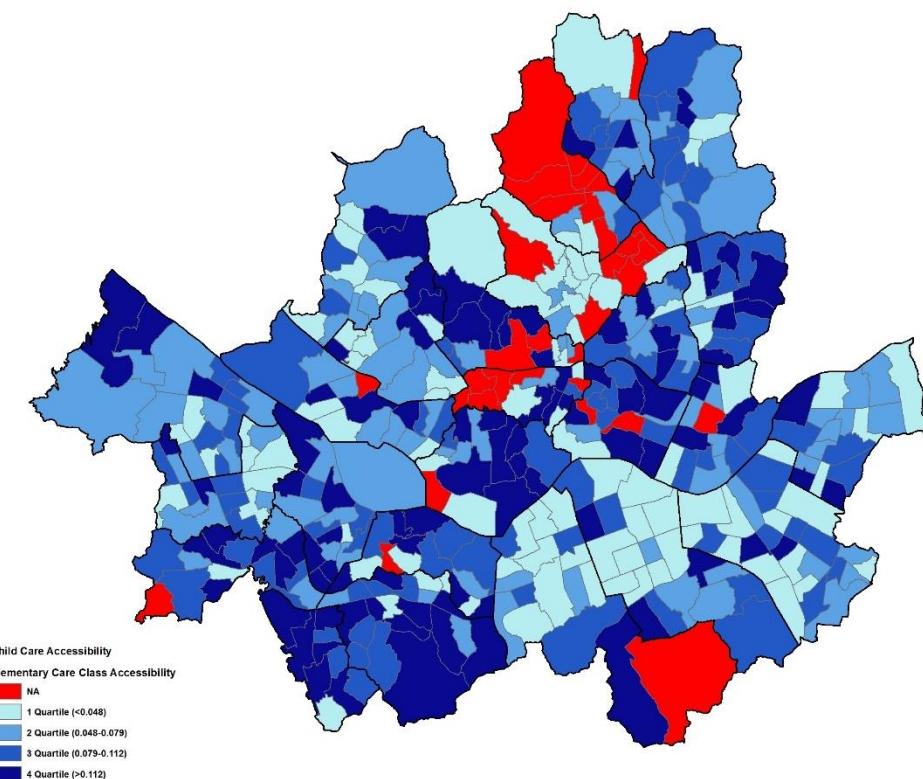


Figure 10. Spatial Distribution of Elementary Care Class Accessibility in Dongs

Table 15. Schools without After-School Child Care Service

Gu	Number of Schools without Elementary Care Classes	
	Public	Private
Gangnam-gu	2	
Gangdong-gu	3	
Gangbuk-gu		1
Gangseo-gu		1
Gwangjin-gu		3
Guro-gu	1	
Geumcheon-gu		1
Dongjak-gu		1
Seodaemun-gu		4
Seocho-gu		1
Seongbuk-gu		4
Yongsan-gu		1
Eunpyeong-gu		3
Jongno-gu	1	2
Jung-gu		3
Jungnang-gu		1
Total	7 (22.6%)	24 (77.4%)

To identify regional characteristics associated with Elementary Care Class accessibility, mean values of socio-economic variables by each quartile group are first sorted (Table 16). Then, below findings are obtained.

First, household sizes and child population have a negative relationship with the level of accessibility. Areas with less Elementary Care Class accessibility have fewer small households and more child populations. This variable somewhat corresponds to the child population ratio since small

households comprise one- and two-person households. Thus, it can be inferred that dongs with many households with children are least accessible to Elementary Care Classes. This finding reveals the current status of the extreme after-school child care deficit in Seoul. If the current provision of Elementary Care classes was relative to the size of the child population in the area, such a trend should not have existed. Because schools do not offer enough child care seats despite the large portion of residents being families with children, there is more competition for the child care service in these regions¹⁸.

In addition, other variables distinguish the first quartile groups from the rest. First, the Dongs in the first quartile have a noticeably low ratio of National Basic Living Security recipients and high housing and land prices compared to the second, third, and fourth quartile groups. Considering that the children with better socio-economic backgrounds customarily go to private academic institutions after school, it is possible to suggest that the Dongs in the first quartile groups and their low Elementary Care Class accessibility is a justified service distribution.

Also, there are regional characteristics that set apart the fourth quantile group from the rest. For example, the fourth group has fewer

¹⁸ A criticism may arise arguing that the phenomenon is due to families with children being more likely to live in privileged areas, thus not wanting public child care services. Although the author acknowledges this issue and that it is possibly true for some areas because it is too early to conclude that such behavior is a general trend in Seoul, in this study, the author described only the findings from the given statistics.

apartments, low population density, and housing prices than the rest. In other words, less populated areas with low-cost housing have the greatest accessibility to Elementary Care Classes. This is a favorable finding suggesting that the spatial distribution of Elementary Care Classes corresponds to the characteristics of children the universal child care aims to cover despite the accessibility score still not enough.

Lastly, the areas without Elementary Care Class accessibility exhibit interesting characteristics. These areas mutually share characteristics that set apart the first and the fourth quantile groups from the rest. First, similar to the fourth quantile group, the Dongs without accessibility have the lowest population density, medium and large households and children, and the highest number of independent houses and commercial units. Then, resembling the first quantile group, these Dongs have the highest land price. Additionally, unrelated to all the other quantile groups, these regions have the highest number of National Basic Living Security recipients. In short, the regions with less population, fewer families with children, yet with more people in financial need, where the lands are expensive, and there is a large number of independent houses, and commercial units do not have access to Elementary Care Classes.

Table 16. Descriptive Statistics of Dongs by Elementary Care Class Accessibility Quartiles

	Elementary Care Class Accessibility				
	NA (N=33)	Very low 1st Q (N=102)	Low 2nd Q (N=94)	High 3rd Q (N=99)	Very High 4th Q (N=97)
Range	0	<0.048	0.048- 0.0785	0.0785- 0.112	>0.0112
Variable					
Population Density (Population / km ²)	18447.32	24597.79	23638.16	25365.64	20920.05
Small Household (%)	71.8	59.7	63.3	63.8	71.2
Medium Household (%)	25	35.7	32.6	32.1	25.6
Large Household (%)	3.1	4.6	4.1	4	3.2
Average Age	45.4	43.5	43.6	44.2	44.6
Child Population (%)	2.9	4.6	4.2	4.1	3
National Basic Living Security Recipients (%)	5	3.2	4	4.7	4.4
Independent Houses (%)	6.1	2.5	2.4	1.6	4.7
Multi-Units (%)	44	35.2	35.7	33.5	47.2
Apartments (%)	44.5	59.6	59.1	62.4	42.4
Commercial Units (%)	5.4	2.7	2.9	2.5	4.6
Housing Price (10,000 Won/ m ²)	869.83	1005.87	902.38	915.74	860.84
Land Price (10,000 Won/ m ²)	544.51	543.12	412.47	400.56	420.50

2) Community Child Care Center

The Community Child Care Center accessibility at the Dong level is presented in Table 17. Among 425 Dongs, there were 93 Dongs without accessibility. Within the 332 Dongs that have access to community child care, the average accessibility score is 0.073, meaning there are 73 seats available

per 1,000 students. The Dong with the minimum accessibility has a score of 0.002, while the Dong with the maximum accessibility has 1.476, 1476 seats available per 1,000 students¹⁹.

Table 17. Dong Level Community Child Care Center Accessibility

	N	Mean	Std	Min	25%	50%	75%	Max
Community Child Care Center Accessibility	332	0.073	0.114	0.002	0.023	0.048	0.091	1.476

Figure 11 shows the spatial distribution of Community Child Care Center accessibility in dongs. It is noticeable that the large areas across the vertical axis do not have access to Community Child Care Centers. These areas are mainly in Seocho-gu, Gangnam-gu in the south of the Han River, and Yongsan-gu, Jung-gu, and Jongno-gu in the north. Seocho-gu, Gangnam-gu, and Yongsan-gu can be characterized as Gus with a higher level of socio-economic status, and Jung-gu and Jongno-gu can be described as the old city center.

To understand the regional characteristics associated with the Community Child Care Center accessibility levels, each quartile group's mean values are sorted by socio-economic variables (Table 18). From the descriptive statistics, the findings below are obtained.

¹⁹ Again, it should be noted that this is an extreme outlier indicating that the regions' Community Child Care Centers are poorly located for their children to commute. The second highest accessibility score is 0.814.

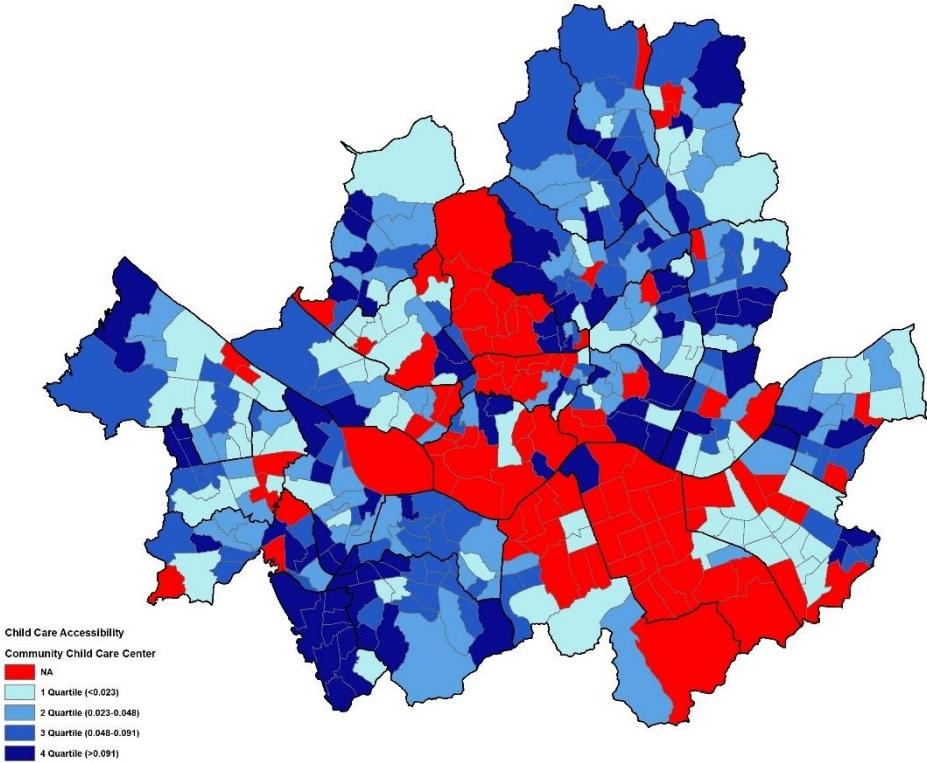


Figure 11. Spatial Distribution of Community Child Care Center Accessibility in Dongs

First, compared to the Elementary Care Class accessibility, the socio-economic characteristics of Community Child Care Center accessibility quartile groups have a consistent relationship with the level of accessibility with a gradual value change across the groups. In other words, unlike the Elementary Care Class accessibility, no factor sets apart the first or fourth quartile groups from the second and third groups. For example, with Community Child Care Center accessibility, Dongs with low accessibility have a bigger number of medium and large households and children, a younger population, fewer national living security recipients, and more

apartments with higher prices. Conversely, Dongs with high accessibility have a smaller number of medium and large households and children, an older population, more national living security recipients, and fewer apartments.

The socio-economic difference between regions with low accessibility and high accessibility becomes even more apparent when looking at the areas without access to Community Child Care Centers. These areas have significantly low population density with the largest number of children, fewest National Basic Living Security recipients, the largest number of apartments, and the highest housing price and land prices. Starkly, this finding demonstrates how the presence and higher accessibility of the Community Child Care Center is a sign of underprivileged areas.

However, interestingly, unlike other variables, the housing price and land price are not corresponding to the relationship between regional characteristics and the Community Child Care Center's accessibility. Dongs with the least accessibility to Community Child Care Center indeed have the highest housing and land price. However, the housing and land price of Dongs in the fourth quartile is not the lowest. This finding suggests a scenario where due to the installation restrictions for the Community Child Care Centers that ban the installation nearby harmful or unsafe facilities for children, community child care are more present in more favorable areas with higher housing prices and land prices. In truth, such a scenario has been an ongoing issue in the operation of Community Child Care Centers where Community

Child Care Centers cannot provide after-school care for the children in the most harmful urban environment yet are unable to pay off the rising rent only by the government subsidies (남수현, 2019; 성태숙, 2014; ⓧ민아; 2021).

Table 18. Descriptive Statistics of Dongs by Community Child Care Center Accessibility Quartiles

	Community Child Care Center Accessibility				
	NA (N=93)	Very low 1st Q (N=84)	Low 2nd Q (N=82)	High 3rd Q (N=83)	Very High 4th Q (N=83)
Range	0	<0.023	0.023- 0.048	0.048- 0.091	>0.091
Variable					
Population Density (Population / km ²)	15712.34	26588.00	24871.30	27336.49	22616.30
Small Household (%)	61.4	59.4	65.8	67.0	72.1
Medium Household (%)	34.1	36.1	30.4	29.4	24.8
Large Household (%)	4.5	4.5	3.8	3.6	3.1
Average Age	43.3	42.9	44.1	44.6	45.5
Child Population (%)	4.8	4.8	3.7	3.4	2.6
National Basic Living Security Recipients (%)	2.8	3.5	4.3	4.8	5.5
Independent Houses (%)	4.2	1.2	2.7	2.3	4.6
Multi-Units (%)	22.8	30.8	41.1	45.8	53.2
Apartments (%)	68.8	65.8	52.9	48.7	37.4
Commercial Units (%)	3.1	2.2	3.3	3.3	4.8
Housing Price (10,000 Won/ m ²)	1283.56	907.20	806.20	770.22	779.19
Land Price (10,000 Won/ m ²)	718.70	422.74	366.36	347.92	377.29

3) Together Care Center

The Together Care Center accessibility at the Dong level is presented in Table 19. Among 425 Dongs, there were 204 Dongs without accessibility. Within the 221 Dongs with access to Together Care Centers, the average accessibility score is 0.03, meaning there are 30 seats available per 1,000 students. The Dong with the minimum accessibility has a score of 0.001, whilst the Dong with the maximum accessibility has 0.335, 335 seats available per 1,000 students.

Table 19. Dong Level Together Care Center Accessibility

	N	Mean	Std	Min	25%	50%	75%	Max
Together Care Center Accessibility	221	0.03	0.035	0.001	0.011	0.02	0.036	0.335

Figure 12 shows the spatial distribution of Community Child Care Center accessibility in dongs. Although, Together Care Centers have the least number of Dongs that have accessibility to their service, the spatial distribution of their services shows signs of clustering across the study area.

First, there are districts where almost every Dong has Together Care Center accessibility: Guro-gu, Yongdeungpo-gu, and Eunpyeong-gu. Then, the Dongs within the fourth quartile group are located on the border of Gus, such as the ones in Yongsan-gu, Seongdong-gu, Jung-gu, Jongno-gu, and

Dongdaemun-gu²⁰. Also, it can be found that the service is primarily distributed along the outskirts of Seoul.

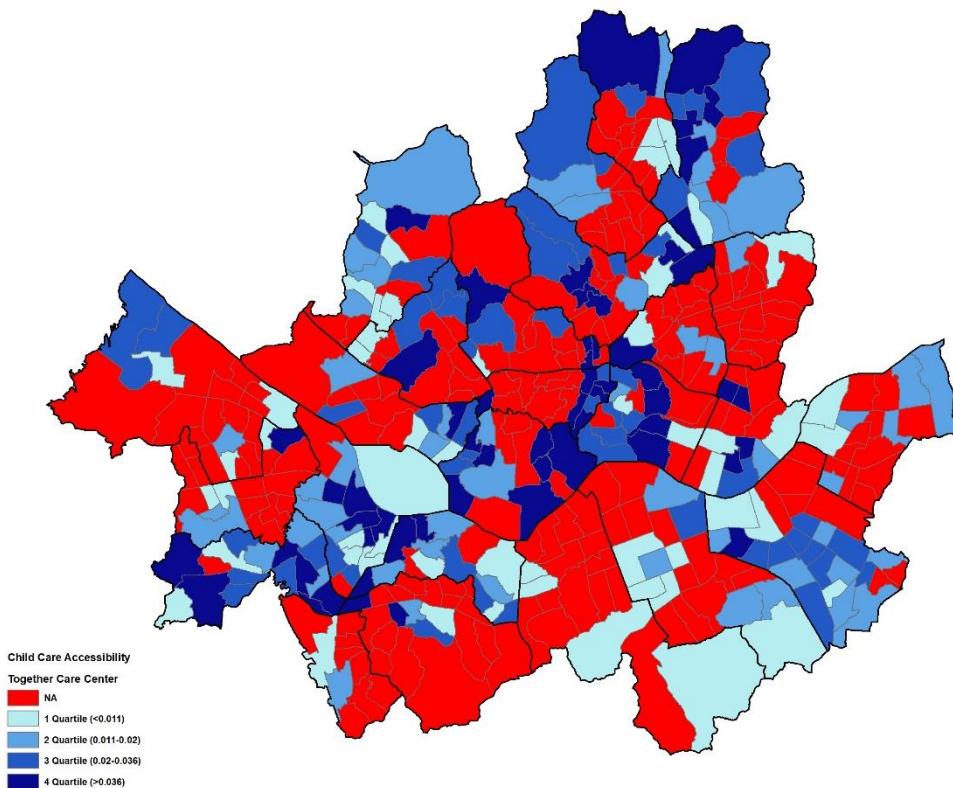


Figure 12. Spatial Distribution of Together Care Center Accessibility in Dongs

To understand the regional characteristics associated with the levels of Together Care Center accessibility, the mean values of socio-economic variables by each quartile group are sorted (Table 20). From the descriptive statistics, findings below are obtained.

²⁰ When calculating service accessibility, because the together care service only accepts children residing in the same district as the center, the author made sure to delete accessibility scores of the facility that overflowed across the district border.

First, among the after-school child care facilities, Together Care Center's accessibility is related to the regional characteristics the least. For instance, except for the household size, child population, and National Basic Living Security recipient population, there was no trend in the value change between quartile groups. Thus, it is possible to argue that the areas with fewer families and children but more National Basic Living Security recipients have higher accessibility to Together Care Center. Also, the characteristics of the Dongs without Together Care Center accessibility are not distinctive from the Dongs with accessibility as well.

Table 20. Descriptive Statistics of Dongs by Together Care Center Accessibility Quartiles

Variable	Together Care Center Accessibility				
	NA (N=204)	Very low 1st Q (N=58)	Low 2nd Q (N=53)	High 3rd Q (N=57)	Very High 4th Q (N=53)
Population Density (Population / km ²)	21988.82	25596.10	24868.22	23463.89	23668.22
Small Household (%)	65.8	61.2	60.4	65	71
Medium Household (%)	30.4	34.4	35.2	31.2	25.7
Large Household (%)	3.8	4.4	4.4	3.8	3.3
Average Age	44.3	43.3	43.4	44.3	44.6
Child Population (%)	3.9	4.6	4.5	3.6	2.9
National Basic Living Security Recipients (%)	4.4	3.4	3.9	4	4.1
Independent Houses (%)	3.3	1.9	1.5	3	4.8
Multi-Units (%)	39.8	33.5	29.2	41.5	44.1
Apartments (%)	52.7	62.3	67.4	52.7	46.7
Commercial Units (%)	3.7	2.4	2	2.9	4.5
Housing Price (10,000 Won/ m ²)	936.11	923.00	926.90	850.24	909.36
Land Price (10,000 Won/ m ²)	489.91	428.93	414.77	410.42	422.38

4) Universal Child Care

In the previous sections, the child care accessibility in Dongs by facility types is estimated and compared with regional characteristics. In this section, all the child care accessibility measures are combined and then analyzed to see which regional characteristics are associated with the provision of universal after-school child care.

The universal after-school child care accessibility at the Dong level is presented in Table 17. Among 425 Dongs, there were 7 Dongs without accessibility. Within the 418 Dongs that have access to universal after-school child care, the average accessibility score is 0.161, meaning there are 161 seats available per 1,000 students. The Dong with the smallest accessibility has a score of 0.01, whilst the Dong with the biggest accessibility has 3.19, 3190 seats available per 1,000 students²¹.

Table 21. Dong Level Universal After-School Child Care Accessibility

	N	Mean	Std	Min	25%	50%	75%	Max
Universal After-School Child Care Accessibility	418	0.161	0.182	0.01	0.083	0.134	0.201	3.19

²¹ Again, this is due to a specific area's poor allocation of service providers.

Figure 13 shows the spatial distribution of universal after-school child care accessibility in Dongs. The areas without access to after-school child care services are mainly clustered in the old city center region. The Dongs with low accessibility are clustered in the Gangnam region, Gangseo-Yangcheon region, the western region of the old city center, and the Bukhansan mountain region in the north.

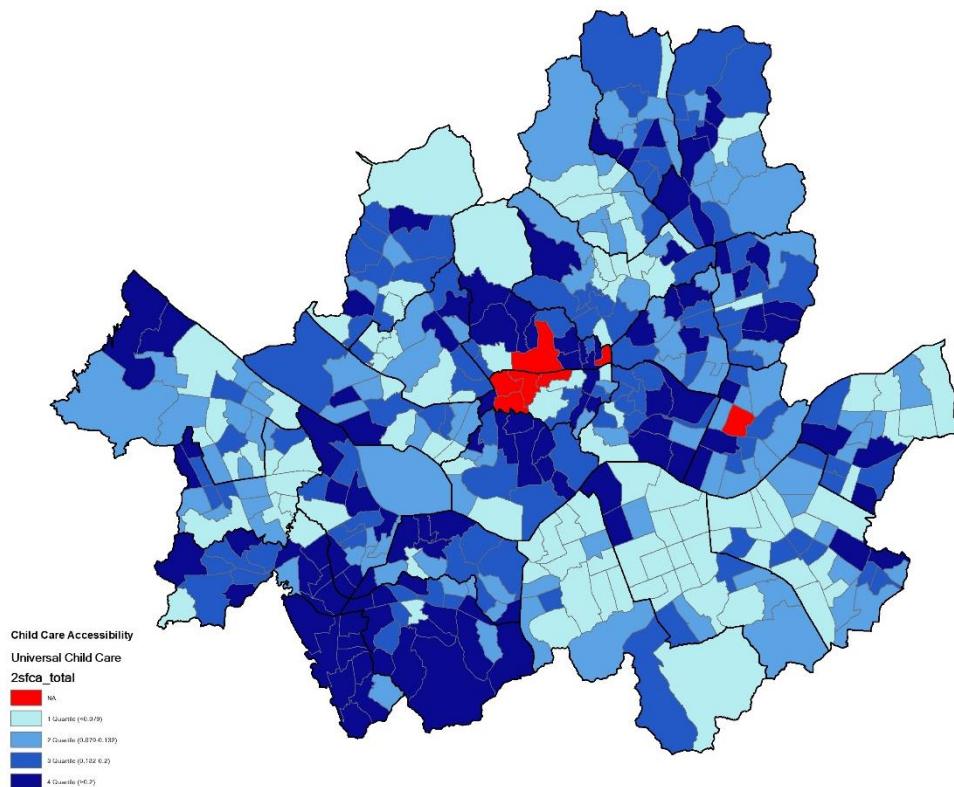


Figure 13. Spatial Distribution of Universal Child Care Accessibility in Dongs

To understand the regional characteristics associated with the universal child care accessibility levels, each quartile group's mean values are

sorted by socio-economic variables (Table 22). From the descriptive statistics, the findings below are obtained.

Table 22. Descriptive Statistics of Dongs by Universal Child Care Accessibility Quartiles

Variable	Universal Care Accessibility				
	NA (N=7)	Very low 1st Q (N=105)	Low 2nd Q (N=106)	High 3rd Q (N=104)	Very High 4th Q (N=103)
Population Density (Population / km ²)	8665.73	22808.98	24487.78	25289.91	21346.68
Small Household (%)	84.5	56.9	62.8	66.6	72.8
Medium Household (%)	13.8	38.2	33.1	29.7	24.2
Large Household (%)	1.8	4.9	4.2	3.7	3
Average Age	47.2	42.5	44.1	44.3	45.2
Child Population (%)	1.5	5.4	4.1	3.5	2.7
National Basic Living Security Recipients (%)	5.3	2.5	4.7	4.5	4.8
Independent Houses (%)	8.4	1.8	1.7	3.1	5.2
Multi-Units (%)	25.8	26.5	36.1	42.4	49.6
Apartments (%)	55.3	69.5	59.7	51.2	39.5
Commercial Units (%)	10.5	2.2	2.5	3.4	4.8
Housing Price (10,000 Won/ m ²)	1225.51	1101.26	891.06	846.70	811.32
Land Price (10,000 Won/ m ²)	1361.27	574.43	389.66	386.02	400.87

First, it can be found that the Dongs with higher accessibility of child care services have smaller family sizes, fewer children, and more National Basic Living Security recipients. Although it is relieving to find out that the child care services are concentrated in the areas with more people in financial need, it is a concern that the child care accessibility is not proportionate to the

child population of the regions. Also, the areas with less accessibility have more apartment buildings and higher housing prices.

However, with the land price, the fourth quartile group has a higher land price than the second and third quartile groups. In other words, the Dongs with higher child care accessibility have fewer socio-economically advantaged people yet higher land prices than second and third quartile Dongs. This disparity between the land and the people could be a situation where the lands recently gained higher recognition than the time most residents moved in.

In addition, the Dongs without access to universal child care show peculiar characteristics. These dongs have extremely low population density, the highest ratio of small households, National Basic Living Security recipients, independent houses and commercial units, the smallest child population, and the most expensive housing and land price. In other words, these Dongs do not have many people residing in the area, let alone children, and they have prime commercial areas where the houses are sold expensively. However, there is also a large portion of people in financial need among the residents²². Therefore, this may be a scenario where there is a disparity in housing so that the prestigious residential units are located alongside the independent houses whose residents receive living security from the

²² These Dongs are Euljiro-dong, Myeong-dong, Jongno 1,2,3,4-ga-dong, Sogon-dong, Hoehyeon-dong, and Sungin 2-dong.

government. Also, their extremely high land price explains why there is not any child care accessibility.

There is a total of 471 elementary school level children residing in these Dongs. It is a problem if they are from underprivileged families yet do not have access to after-school child care because they live in an area where it is too costly to install such facilities. Thus, with these Dongs, a further investigation should be made to decide if an intervention should be made.

5) OLS Regression

Table 23,

Table 24, Table 25, and Table 26 show the OLS regression results of child care accessibilities. The results indicate the insufficient service accessibility that does not correspond to the local child population in all three measures of child care accessibilities.

For both Elementary Care Classes and Community Child Care Centers, the land price negatively affects service accessibility. However, this is not the case for Together Care Center. This attests to the fact that Together Care Centers receive direct funding from the local government, so the rents are out of concern for these facilities (모아라 & 이소현, 2021).

For Elementary Care Classes, the ratio of households with children negatively influenced the accessibility score. This indicates how the Elementary Care Classes offer a limited number of seats disproportionate to the regional characteristics where families with children are densely populated.

Finally, in the OLS regression of Community Child Care Center accessibility, besides the child population and land price, the population of National Basic Living Security recipients has a positive relationship with accessibility. This is a favorable finding that the current accessibility of Community Child Care Centers is distributed, especially in the area with the most need.

Additionally, universal child care accessibility exhibits a significant relationship with the ratio of the child population, National Basic Living Security recipient population, and the land price.

Table 23. OLS Regression of Elementary Care Class Accessibility

SFCA_cc_ln	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lnchild	-.184	.088	-2.11	.036	-.357	-.012	**
lnws	.032	.057	0.56	.579	-.081	.145	
l_price2	-.001	0	-2.74	.007	-.001	0	***
hprice_r	0	0	1.07	.287	0	.001	
genwc_r	-1.535	.633	-2.43	.016	-2.779	-.291	**
h_c	.209	.181	1.15	.25	-.148	.566	
Constant	-1.092	.462	-2.37	.018	-1.999	-.184	**
Mean dependent var		-2.665		SD dependent var		0.830	
R-squared		0.136		Number of obs		392	

F-test	10.067	Prob > F	0.000
Akaike crit. (AIC)	921.781	Bayesian crit. (BIC)	949.580

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 24. OLS Regression of Community Child Care Center Accessibility

SFCA_comc_ln	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lnchild	-.9	.126	-7.14	0	-1.147	-.652	***
lnws	.36	.095	3.80	0	.174	.546	***
l_price2	-.001	.001	-2.31	.022	-.002	0	**
hprice_r	0	0	0.13	.895	-.001	.001	
genwc_r	.797	.862	0.93	.355	-.897	2.492	
h_c	-.324	.246	-1.32	.189	-.808	.16	
Constant	.641	.748	0.86	.392	-.83	2.112	
Mean dependent var	-3.181		SD dependent var	1.118			
R-squared	0.335		Number of obs	332			
F-test	27.242		Prob > F	0.000			
Akaike crit. (AIC)	893.705		Bayesian crit. (BIC)	920.341			

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 25. OLS Regression of Together Care Center

SFCA_tc_ln	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lnchild	-.623	.143	-4.36	0	-.905	-.341	***
lnws	.076	.109	0.70	.485	-.139	.292	
l_price2	0	0	-0.68	.495	-.001	.001	
hprice_r	0	0	0.62	.533	0	.001	
genwc_r	-.287	1.033	-0.28	.781	-2.322	1.748	
h_c	.169	.291	0.58	.562	-.405	.744	
Constant	-.365	.864	-0.42	.673	-2.068	1.339	
Mean dependent var	-3.971		SD dependent var	1.018			
R-squared	0.187		Number of obs	221			
F-test	8.195		Prob > F	0.000			
Akaike crit. (AIC)	602.318		Bayesian crit. (BIC)	626.105			

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 26. OLS Regression of Universal Child Care Accessibility

SFCA_total_ln	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lnchild	-.4	.072	-5.56	0	-.541	-.259	***
lnws	.151	.047	3.20	.001	.058	.244	***
l_price2	-.001	0	-3.22	.001	-.001	0	***
hprice_r	0	0	-0.42	.677	0	0	
genwc_r	-.693	.519	-1.33	.183	-1.713	.328	
h_c	-.039	.146	-0.27	.788	-.325	.247	
Constant	.147	.377	0.39	.696	-.594	.889	
Mean dependent var	-2.110		SD dependent var	0.802			

R-squared	0.356	Number of obs	418
F-test	37.842	Prob > F	0.000
Akaike crit. (AIC)	830.717	Bayesian crit. (BIC)	858.965

*** $p < .01$, ** $p < .05$, * $p < .1$

Chapter 6. Conclusion

6.1 Discussion

Inequality begins early, and early intervention could alleviate the socio-economic hardship especially experienced by children at a young age, potentially reducing the social costs of the inequality. With this acknowledgment, developed countries worldwide, such as the Scandinavian countries, western Europe, Canada, and the United States, have been investing in providing universal child care services.

In Korea, universal child care has been one of the essential political agendas since 2004. Since then, many efforts have been made to make the child care service more available to families with children. However, even though making social services accessible to a broader population requires spatial analysis, there were no such studies. Therefore, this study calculated the service accessibility of child care services across Seoul, Korea, and analyzed the service distribution and the regional characteristics that have the most substantial relationship to the level of accessibility.

From the analysis, the study found that the level of accessibility generally follows the socio-economic characteristics of the region. However, even within the regions with comparatively high accessibilities, the supply-to-demand ratio is far too less than the surveyed 51.3% of the demand. In

addition, the study has found the significant effect of land price on universal child care accessibility.

From the findings, the study concludes that more facilities should be installed in the areas with a higher demand to make child care more accessible. In other words, instead of covering the whole city with the catchment of child care facilities, more facilities should be built to moderate the supply-to-demand burden of a facility in the region so that the average 16.1% service provision can be increased by focusing on the areas with the most need. For instance, child care clusters of all different facility types can be a solution.

In order to do so, the most viable suggestion is to increase Community Child Care Centers. As a combined model of public and private partnership, the smaller operating size of Community Child Care Centers is advantageous in providing more child care services closer to the population. However, Community Child Care Centers have difficulty paying the rent due to the limited government subsidies. In other words, if an area's average rent is high, even if the area has a lot of children in need of child care service, the child care center is less likely to be installed since the government subsidies are the same regardless of the service location.

Moreover, there should be a discourse on the installation restriction of child care centers. The finding discovered that the Dongs with less accessibility to Community Child Care Centers have low socio-economic

indicators. This illustrates a situation where the installation of Community Child Care Centers is restricted due to the pre-existing harmful environments. Then, what should one do with these areas? They indeed have conditions that could pose a threat to the development of the children. Hence providing the child care service may seem inadequate. However, it should be remembered that children still live in those areas with less access to the child care service. Therefore, further investigations and discussions should be made to resolve these issues.

6.2 Limitations

This study conducted an exploratory analysis on the provision of the universal child care service in Korea, emphasizing spatial measures. However, the study has limitations in its inaccessibility to other important socio-economic variables such as the parent's level of education, types of occupations, and house ownership. Moreover, the study bears the issue that the subtle difference between each facility type was not incorporated into the analysis. These limitations should be overcome with more access to data and policy development.

Appendix



<i>ID</i>	Gu (Kor)	Gu (Eng)	Dong (Kor)	Dong (Eng)	2sfca_comc	2sfca_cc	2sfca_tc
0	종로구	Jongno-gu	사직동	Sajik-dong	0.000	0.053	0.000
1	종로구	Jongno-gu	삼청동	Samcheong-dong	0.000	0.287	0.000
2	종로구	Jongno-gu	부암동	Buam-dong	0.000	0.224	0.048
3	종로구	Jongno-gu	평창동	Pyeongchang-dong	0.000	0.046	0.000
4	종로구	Jongno-gu	무악동	Muak-dong	0.057	0.089	0.034
5	종로구	Jongno-gu	교남동	Gyonam-dong	0.073	0.091	0.007
6	종로구	Jongno-gu	가회동	Gahoe-dong	0.000	0.313	0.000
7	종로구	Jongno-gu	종로 1.2.3.4 가동	Jongno 1·2·3·4(ilisamsa)-ga-dong	0.000	0.000	0.000
8	종로구	Jongno-gu	종로 5·6 가동	Jongno 5·6(oryuk)-ga-dong	1.476	1.714	0.000
9	종로구	Jongno-gu	이화동	Ihwa-dong	0.438	0.000	0.000
10	종로구	Jongno-gu	창신 1 동	Changsin 1(il)-dong	0.685	0.021	0.043
11	종로구	Jongno-gu	창신 2 동	Changsin 2(i)-dong	0.814	0.014	0.000
12	종로구	Jongno-gu	창신 3 동	Changsin 3(sam)-dong	0.047	0.051	0.043
13	종로구	Jongno-gu	승인 1 동	Sungin 1(il)-dong	0.076	0.050	0.133
14	종로구	Jongno-gu	승인 2 동	Sungin 2(i)-dong	0.000	0.000	0.000
15	종로구	Jongno-gu	청운효자동	Cheongunhyoja-dong	0.000	0.218	0.034
16	종로구	Jongno-gu	혜화동	Hyehwa-dong	0.000	0.136	0.029
17	중구	Jung-gu	소공동	Sogong-dong	0.000	0.000	0.000
18	중구	Jung-gu	회현동	Hoehyeon-dong	0.000	0.000	0.000
19	중구	Jung-gu	명동	Myeong-dong	0.000	0.000	0.000
20	중구	Jung-gu	필동	Pil-dong	0.000	0.040	0.000
21	중구	Jung-gu	장충동	Jangchung-dong	0.033	0.163	0.000
22	중구	Jung-gu	광희동	Gwanghui-dong	0.000	0.070	0.000
23	중구	Jung-gu	을지로동	Euljiro-dong	0.000	0.000	0.000
24	중구	Jung-gu	신당 5 동	Sindang 5(o)-dong	0.068	0.000	0.043
25	중구	Jung-gu	황학동	Hwanghak-dong	0.011	0.041	0.022
26	중구	Jung-gu	중림동	Jungnim-dong	0.084	0.000	0.233
27	중구	Jung-gu	신당동	Sindang-dong	0.000	0.314	0.078
28	중구	Jung-gu	다산동	Dasan-dong	0.117	0.222	0.055
29	중구	Jung-gu	약수동	Yaksu-dong	0.010	0.007	0.115
30	중구	Jung-gu	청구동	Cheonggu-dong	0.052	0.265	0.028
31	중구	Jung-gu	동화동	Donghwa-dong	0.044	0.097	0.054
32	용산구	Yongsan-gu	후암동	Huam-dong	0.182	0.158	0.000
33	용산구	Yongsan-gu	용산 2 가동	Yongsan 2-ga-dong	0.007	0.278	0.000
34	용산구	Yongsan-gu	남영동	Namyeong-dong	0.148	0.057	0.000

35	용산구	Yongsan-gu	원효로 2 동	Wonhyoro 2(i)-dong	0.000	0.023	0.022
36	용산구	Yongsan-gu	효창동	Hyochang-dong	0.061	0.101	0.083
37	용산구	Yongsan-gu	용문동	Yongmun-dong	0.000	0.064	0.034
38	용산구	Yongsan-gu	이촌 1 동	Ichon 1(il)-dong	0.000	0.023	0.000
39	용산구	Yongsan-gu	이촌 2 동	Ichon 2(i)-dong	0.000	0.000	0.093
40	용산구	Yongsan-gu	이태원 1 동	Itaewon 1(il)-dong	0.000	0.392	0.103
41	용산구	Yongsan-gu	이태원 2 동	Itaewon 2(i)-dong	0.000	0.219	0.112
42	용산구	Yongsan-gu	서빙고동	Seobinggo-dong	0.000	0.139	0.061
43	용산구	Yongsan-gu	보광동	Bogwang-dong	0.148	0.146	0.000
44	용산구	Yongsan-gu	청파동	Cheongpa-dong	0.034	0.113	0.011
45	용산구	Yongsan-gu	원효로 1 동	Wonhyoro 1(il)-dong	0.000	0.070	0.059
46	용산구	Yongsan-gu	한강로동	Hangangno-dong	0.000	0.133	0.014
47	용산구	Yongsan-gu	한남동	Hannam-dong	0.000	0.111	0.049
48	성동구	Seongdong-gu	왕십리 2 동	Wangsimni 2(i)-dong	0.092	0.087	0.019
49	성동구	Seongdong-gu	마장동	Majang-dong	0.039	0.105	0.045
50	성동구	Seongdong-gu	사근동	Sageun-dong	0.000	0.158	0.079
51	성동구	Seongdong-gu	행당 1 동	Haengdang 1(il)-dong	0.035	0.111	0.000
52	성동구	Seongdong-gu	행당 2 동	Haengdang 2(i)-dong	0.038	0.105	0.009
53	성동구	Seongdong-gu	웅봉동	Eungbong-dong	0.026	0.100	0.021
54	성동구	Seongdong-gu	금호 1 가동	Geumho 1(il)-ga-dong	0.002	0.000	0.025
55	성동구	Seongdong-gu	금호 4 가동	Geumho 4(sa)-ga-dong	0.000	0.078	0.025
56	성동구	Seongdong-gu	성수 1 가 1 동	Seongsu 1(il)-ga1(il)-dong	0.127	0.206	0.036
57	성동구	Seongdong-gu	성수 1 가 2 동	Seongsu 1(il)-ga2(i)-dong	0.165	0.000	0.042
58	성동구	Seongdong-gu	성수 2 가 1 동	Seongsu 2(i)-ga1(il)-dong	0.130	0.210	0.000
59	성동구	Seongdong-gu	성수 2 가 3 동	Seongsu 2(i)-ga3(sam)-dong	0.017	0.099	0.010
60	성동구	Seongdong-gu	송정동	Songjeong-dong	0.092	0.069	0.000
61	성동구	Seongdong-gu	용답동	Yongdap-dong	0.138	0.134	0.000
62	성동구	Seongdong-gu	왕십리도선동	WangsimniDoseon-dong	0.025	0.119	0.028
63	성동구	Seongdong-gu	금호 2.3 가동	Geumho 2-3(i-sam)-ga-dong	0.048	0.149	0.000
64	성동구	Seongdong-gu	옥수동	Oksu-dong	0.000	0.041	0.020
65	광진구	Gwangjin-gu	화양동	Hwayang-dong	0.096	0.190	0.003
66	광진구	Gwangjin-gu	군자동	Gunja-dong	0.055	0.064	0.000
67	광진구	Gwangjin-gu	중곡 1 동	Junggok 1(il)-dong	0.032	0.146	0.044

68	광진구	Gwangjin-gu	중곡 2 동	Junggok 2(i)-dong	0.030	0.055	0.040
69	광진구	Gwangjin-gu	중곡 3 동	Junggok 3(sam)-dong	0.062	0.133	0.000
70	광진구	Gwangjin-gu	중곡 4 동	Junggok 4(sa)-dong	0.091	0.022	0.000
71	광진구	Gwangjin-gu	능동	Neung-dong	0.000	0.000	0.000
72	광진구	Gwangjin-gu	구의 1 동	Guui 1(il)-dong	0.072	0.068	0.047
73	광진구	Gwangjin-gu	구의 2 동	Guui 2(i)-dong	0.024	0.147	0.000
74	광진구	Gwangjin-gu	구의 3 동	Guui 3(sam)-dong	0.005	0.085	0.019
75	광진구	Gwangjin-gu	광장동	Gwangjang-dong	0.000	0.082	0.003
76	광진구	Gwangjin-gu	자양 1 동	Jayang 1(il)-dong	0.059	0.086	0.044
77	광진구	Gwangjin-gu	자양 2 동	Jayang 2(i)-dong	0.014	0.063	0.025
78	광진구	Gwangjin-gu	자양 3 동	Jayang 3(sam)-dong	0.019	0.090	0.011
79	광진구	Gwangjin-gu	자양 4 동	Jayang 4(sa)-dong	0.237	0.017	0.000
80	동대문구	Dongdaemun-gu	회기동	Hoegi-dong	0.000	0.294	0.000
81	동대문구	Dongdaemun-gu	휘경 1 동	Hwigyeong 1(il)-dong	0.179	0.020	0.000
82	동대문구	Dongdaemun-gu	휘경 2 동	Hwigyeong 2(i)-dong	0.061	0.083	0.000
83	동대문구	Dongdaemun-gu	청량리동	Cheongnyangni-dong	0.042	0.061	0.000
84	동대문구	Dongdaemun-gu	용신동	Yongsin-dong	0.003	0.102	0.050
85	동대문구	Dongdaemun-gu	제기동	Jegi-dong	0.028	0.225	0.007
86	동대문구	Dongdaemun-gu	전농 1 동	Jeonnong 1(il)-dong	0.018	0.068	0.000
87	동대문구	Dongdaemun-gu	전농 2 동	Jeonnong 2(i)-dong	0.115	0.210	0.019
88	동대문구	Dongdaemun-gu	답십리 2 동	Dapsimnii 2(i)-dong	0.033	0.123	0.000
89	동대문구	Dongdaemun-gu	장안 1 동	Jangan 1(il)-dong	0.002	0.104	0.000
90	동대문구	Dongdaemun-gu	장안 2 동	Jangan 2(i)-dong	0.007	0.058	0.017
91	동대문구	Dongdaemun-gu	이문 1 동	Imun 1(il)-dong	0.181	0.064	0.000
92	동대문구	Dongdaemun-gu	이문 2 동	Imun 2(i)-dong	0.019	0.093	0.000
93	동대문구	Dongdaemun-gu	답십리 1 동	Dapsimnii 1(il)-dong	0.015	0.080	0.000
94	중랑구	Jungnang-gu	면목 2 동	Myeonmok 2(i)-dong	0.093	0.074	0.000
95	중랑구	Jungnang-gu	면목 4 동	Myeonmok 4(sa)-dong	0.021	0.158	0.000
96	중랑구	Jungnang-gu	면목 5 동	Myeonmok 5(o)-dong	0.182	0.003	0.000
97	중랑구	Jungnang-gu	면목 7 동	Myeonmok 7(chil)-dong	0.029	0.094	0.000

98	중랑구	Jungnang-gu	상봉 1 동	Sangbong 1(il)-dong	0.077	0.094	0.000
99	중랑구	Jungnang-gu	상봉 2 동	Sangbong 2(i)-dong	0.042	0.016	0.000
100	중랑구	Jungnang-gu	중화 1 동	Junghwa 1(il)-dong	0.030	0.208	0.000
101	중랑구	Jungnang-gu	중화 2 동	Junghwa 2(i)-dong	0.077	0.019	0.000
102	중랑구	Jungnang-gu	목 1 동	Muk 1(il)-dong	0.037	0.085	0.012
103	중랑구	Jungnang-gu	목 2 동	Muk 2(i)-dong	0.000	0.213	0.000
104	중랑구	Jungnang-gu	망우 3 동	Mangu 3(sam)-dong	0.109	0.186	0.000
105	중랑구	Jungnang-gu	신내 1 동	Sinnae 1(il)-dong	0.023	0.099	0.006
106	중랑구	Jungnang-gu	신내 2 동	Sinnae 2(i)-dong	0.071	0.130	0.000
107	중랑구	Jungnang-gu	면목본동	Myeonmokbon-dong	0.167	0.112	0.000
108	중랑구	Jungnang-gu	면목 3.8 동	Myeonmok 3·8(sam-pal)-dong	0.122	0.092	0.000
109	중랑구	Jungnang-gu	망우본동	Mangubon-dong	0.048	0.117	0.000
110	성북구	Seongbuk-gu	돈암 1 동	Donam 1(il)-dong	0.000	0.040	0.000
111	성북구	Seongbuk-gu	돈암 2 동	Donam 2(i)-dong	0.056	0.054	0.036
112	성북구	Seongbuk-gu	안암동	Anam-dong	0.155	0.000	0.000
113	성북구	Seongbuk-gu	보문동	Bomun-dong	0.004	0.035	0.000
114	성북구	Seongbuk-gu	정릉 1 동	Jeongneung 1(il)-dong	0.037	0.017	0.000
115	성북구	Seongbuk-gu	정릉 2 동	Jeongneung 2(i)-dong	0.033	0.022	0.055
116	성북구	Seongbuk-gu	정릉 3 동	Jeongneung 3(sam)-dong	0.338	0.000	0.023
117	성북구	Seongbuk-gu	정릉 4 동	Jeongneung 4(sa)-dong	0.078	0.002	0.022
118	성북구	Seongbuk-gu	길음 1 동	Gireum 1(il)-dong	0.013	0.039	0.000
119	성북구	Seongbuk-gu	길음 2 동	Gireum 2(i)-dong	0.029	0.007	0.026
120	성북구	Seongbuk-gu	월곡 1 동	Wolgok 1(il)-dong	0.057	0.000	0.000
121	성북구	Seongbuk-gu	월곡 2 동	Wolgok 2(i)-dong	0.031	0.000	0.009
122	성북구	Seongbuk-gu	장위 1 동	Jangwi 1(il)-dong	0.070	0.000	0.028
123	성북구	Seongbuk-gu	장위 2 동	Jangwi 2(i)-dong	0.249	0.000	0.101
124	성북구	Seongbuk-gu	장위 3 동	Jangwi 3(sam)-dong	0.047	0.000	0.006
125	성북구	Seongbuk-gu	성북동	Seongbuk-dong	0.158	0.010	0.000
126	성북구	Seongbuk-gu	삼선동	Samseon-dong	0.100	0.048	0.000
127	성북구	Seongbuk-gu	동선동	Dongseon-dong	0.075	0.037	0.038
128	성북구	Seongbuk-gu	종암동	Jongam-dong	0.054	0.031	0.014
129	성북구	Seongbuk-gu	석관동	Seokgwan-dong	0.075	0.020	0.043
130	강북구	Gangbuk-gu	변 1 동	Beon 1(il)-dong	0.089	0.000	0.000
131	강북구	Gangbuk-gu	변 2 동	Beon 2(i)-dong	0.068	0.050	0.000

132	강북구	Gangbuk-gu	변 3 동	Beon 3(sam)-dong	0.100	0.079	0.000
133	강북구	Gangbuk-gu	수유 1 동	Suyu 1(il)-dong	0.031	0.000	0.011
134	강북구	Gangbuk-gu	수유 2 동	Suyu 2(i)-dong	0.089	0.000	0.032
135	강북구	Gangbuk-gu	수유 3 동	Suyu 3(sam)-dong	0.053	0.000	0.000
136	강북구	Gangbuk-gu	삼양동	Samyang-dong	0.047	0.063	0.000
137	강북구	Gangbuk-gu	미아동	Mia-dong	0.012	0.000	0.000
138	강북구	Gangbuk-gu	송중동	Songjung-dong	0.077	0.000	0.000
139	강북구	Gangbuk-gu	송천동	Songcheon-dong	0.101	0.007	0.000
140	강북구	Gangbuk-gu	삼각산동	Samgaksan-dong	0.019	0.042	0.000
141	강북구	Gangbuk-gu	우이동	Ui-dong	0.063	0.000	0.025
142	강북구	Gangbuk-gu	인수동	Insu-dong	0.025	0.000	0.014
143	도봉구	Dobong-gu	쌍문 1 동	Ssangmun 1(il)-dong	0.131	0.178	0.000
144	도봉구	Dobong-gu	쌍문 2 동	Ssangmun 2(i)-dong	0.043	0.095	0.000
145	도봉구	Dobong-gu	쌍문 3 동	Ssangmun 3(sam)-dong	0.103	0.101	0.000
146	도봉구	Dobong-gu	쌍문 4 동	Ssangmun 4(sa)-dong	0.011	0.096	0.000
147	도봉구	Dobong-gu	방학 1 동	Banghak 1(il)-dong	0.028	0.055	0.000
148	도봉구	Dobong-gu	방학 2 동	Banghak 2(i)-dong	0.064	0.070	0.028
149	도봉구	Dobong-gu	방학 3 동	Banghak 3(sam)-dong	0.025	0.083	0.000
150	도봉구	Dobong-gu	창 1 동	Chang 1(il)-dong	0.054	0.078	0.010
151	도봉구	Dobong-gu	창 2 동	Chang 2(i)-dong	0.092	0.050	0.000
152	도봉구	Dobong-gu	창 3 동	Chang 3(sam)-dong	0.060	0.121	0.000
153	도봉구	Dobong-gu	창 4 동	Chang 4(sa)-dong	0.046	0.072	0.001
154	도봉구	Dobong-gu	창 5 동	Chang 5(o)-dong	0.048	0.161	0.007
155	도봉구	Dobong-gu	도봉 1 동	Dobong 1(il)-dong	0.076	0.041	0.036
156	도봉구	Dobong-gu	도봉 2 동	Dobong 2(i)-dong	0.000	0.000	0.016
157	노원구	Nowon-gu	월계 1 동	Wolgye 1(il)-dong	0.029	0.054	0.050
158	노원구	Nowon-gu	월계 2 동	Wolgye 2(i)-dong	0.071	0.098	0.035
159	노원구	Nowon-gu	월계 3 동	Wolgye 3(sam)-dong	0.133	0.069	0.010
160	노원구	Nowon-gu	공릉 2 동	Gongneung 2(i)-dong	0.002	0.073	0.020
161	노원구	Nowon-gu	하계 1 동	Hagye 1(il)-dong	0.033	0.081	0.000
162	노원구	Nowon-gu	하계 2 동	Hagye 2(i)-dong	0.020	0.053	0.015
163	노원구	Nowon-gu	중계본동	Junggyebon-dong	0.029	0.049	0.022
164	노원구	Nowon-gu	중계 1 동	Junggye 1(il)-dong	0.006	0.039	0.000
165	노원구	Nowon-gu	중계 4 동	Junggye 4(sa)-dong	0.035	0.034	0.000
166	노원구	Nowon-gu	상계 1 동	Sanggye 1(il)-dong	0.060	0.082	0.053
167	노원구	Nowon-gu	상계 2 동	Sanggye 2(i)-dong	0.102	0.081	0.019

168	노원구	Nowon-gu	상계 5 동	Sanggye 5(o)-dong	0.029	0.135	0.060
169	노원구	Nowon-gu	상계 8 동	Sanggye 8(pal)-dong	0.005	0.107	0.031
170	노원구	Nowon-gu	상계 9 동	Sanggye 9(gu)-dong	0.000	0.086	0.027
171	노원구	Nowon-gu	상계 10 동	Sanggye 10(sip)-dong	0.000	0.061	0.081
172	노원구	Nowon-gu	상계 3.4 동	Sanggye 3·4(sam-sa)-dong	0.091	0.076	0.028
173	노원구	Nowon-gu	상계 6.7 동	Sanggye 6·7(yuk-chil)-dong	0.020	0.107	0.075
174	노원구	Nowon-gu	중계 2.3 동	Junggye 2·3(i-sam)-dong	0.016	0.093	0.016
175	노원구	Nowon-gu	공릉 1 동	Gongneung 1(il)-dong	0.062	0.098	0.014
176	은평구	Eunpyeong-gu	녹번동	Nokbeon-dong	0.070	0.056	0.020
177	은평구	Eunpyeong-gu	불광 1 동	Bulgwang 1(il)-dong	0.043	0.129	0.000
178	은평구	Eunpyeong-gu	갈현 1 동	Galhyeon 1(il)-dong	0.138	0.024	0.002
179	은평구	Eunpyeong-gu	갈현 2 동	Galhyeon 2(i)-dong	0.097	0.040	0.022
180	은평구	Eunpyeong-gu	구산동	Gusan-dong	0.043	0.085	0.018
181	은평구	Eunpyeong-gu	대조동	Daejo-dong	0.042	0.077	0.005
182	은평구	Eunpyeong-gu	응암 1 동	Eungam 1(il)-dong	0.032	0.043	0.000
183	은평구	Eunpyeong-gu	응암 2 동	Eungam 2(i)-dong	0.008	0.049	0.011
184	은평구	Eunpyeong-gu	신사 1 동	Sinsa 1(il)-dong	0.036	0.064	0.008
185	은평구	Eunpyeong-gu	신사 2 동	Sinsa 2(i)-dong	0.101	0.106	0.014
186	은평구	Eunpyeong-gu	증산동	Jeungsan-dong	0.089	0.056	0.000
187	은평구	Eunpyeong-gu	수색동	Susaek-dong	0.000	0.039	0.000
188	은평구	Eunpyeong-gu	진관동	Jingwan-dong	0.004	0.058	0.012
189	은평구	Eunpyeong-gu	불광 2 동	Bulgwang 2(i)-dong	0.041	0.162	0.057
190	은평구	Eunpyeong-gu	응암 3 동	Eungam 3(sam)-dong	0.113	0.076	0.002
191	은평구	Eunpyeong-gu	역촌동	Yeokchon-dong	0.107	0.038	0.013
192	서대문구	Seodaemun-gu	천연동	Cheonyeon-dong	0.103	0.074	0.000
193	서대문구	Seodaemun-gu	홍제 1 동	Hongje 1(il)-dong	0.047	0.154	0.000
194	서대문구	Seodaemun-gu	홍제 3 동	Hongje 3(sam)-dong	0.012	0.189	0.033
195	서대문구	Seodaemun-gu	홍제 2 동	Hongje 2(i)-dong	0.059	0.042	0.000
196	서대문구	Seodaemun-gu	홍은 1 동	Hongeun 1(il)-dong	0.000	0.154	0.029
197	서대문구	Seodaemun-gu	홍은 2 동	Hongeun 2(i)-dong	0.006	0.051	0.022
198	서대문구	Seodaemun-gu	남가좌 1 동	Namgajwa 1(il)-dong	0.000	0.021	0.000
199	서대문구	Seodaemun-gu	남가좌 2 동	Namgajwa 2(i)-dong	0.017	0.046	0.000

200	서대문구	Seodaemun-gu	북가좌 1 동	Bukgajwa 1(il)-dong	0.021	0.131	0.010
201	서대문구	Seodaemun-gu	북가좌 2 동	Bukgajwa 2(i)-dong	0.017	0.043	0.009
202	서대문구	Seodaemun-gu	충현동	Chunghyeon-dong	0.101	0.037	0.000
203	서대문구	Seodaemun-gu	북아현동	Bugahyeon-dong	0.014	0.029	0.000
204	서대문구	Seodaemun-gu	신촌동	Sinchon-dong	0.000	0.063	0.000
205	서대문구	Seodaemun-gu	연희동	Yeonhui-dong	0.008	0.059	0.038
206	마포구	Mapo-gu	용강동	Yonggang-dong	0.000	0.063	0.011
207	마포구	Mapo-gu	대흥동	Daeheung-dong	0.031	0.137	0.021
208	마포구	Mapo-gu	염리동	Yeomni-dong	0.043	0.079	0.019
209	마포구	Mapo-gu	신수동	Sinsu-dong	0.022	0.053	0.005
210	마포구	Mapo-gu	서교동	Seogyo-dong	0.045	0.145	0.000
211	마포구	Mapo-gu	합정동	Hapjeong-dong	0.268	0.040	0.000
212	마포구	Mapo-gu	망원 1 동	Mangwon 1(il)-dong	0.052	0.046	0.032
213	마포구	Mapo-gu	망원 2 동	Mangwon 2(i)-dong	0.055	0.221	0.000
214	마포구	Mapo-gu	연남동	Yeonnam-dong	0.006	0.000	0.000
215	마포구	Mapo-gu	성산 1 동	Seongsan 1(il)-dong	0.020	0.068	0.000
216	마포구	Mapo-gu	성산 2 동	Seongsan 2(i)-dong	0.022	0.070	0.013
217	마포구	Mapo-gu	상암동	Sangam-dong	0.052	0.104	0.000
218	마포구	Mapo-gu	도화동	Dohwa-dong	0.028	0.045	0.001
219	마포구	Mapo-gu	서강동	Seogang-dong	0.002	0.063	0.000
220	마포구	Mapo-gu	공덕동	gongdeok-dong	0.000	0.087	0.032
221	마포구	Mapo-gu	아현동	Ahyeon-dong	0.000	0.075	0.042
222	양천구	Yangcheon-gu	목 1 동	Mok 1(il)-dong	0.000	0.045	0.000
223	양천구	Yangcheon-gu	목 2 동	Mok 2(i)-dong	0.045	0.069	0.036
224	양천구	Yangcheon-gu	목 3 동	Mok 3(sam)-dong	0.082	0.001	0.003
225	양천구	Yangcheon-gu	목 4 동	Mok 4(sa)-dong	0.019	0.037	0.000
226	양천구	Yangcheon-gu	신월 1 동	Sinwol 1(il)-dong	0.106	0.048	0.000
227	양천구	Yangcheon-gu	신월 2 동	Sinwol 2(i)-dong	0.054	0.121	0.007
228	양천구	Yangcheon-gu	신월 3 동	Sinwol 3(sam)-dong	0.667	0.096	0.000
229	양천구	Yangcheon-gu	신월 4 동	Sinwol 4(sa)-dong	0.051	0.080	0.002
230	양천구	Yangcheon-gu	신월 5 동	Sinwol 5(o)-dong	0.101	0.113	0.000
231	양천구	Yangcheon-gu	신월 6 동	Sinwol 6(yuk)-dong	0.010	0.058	0.020
232	양천구	Yangcheon-gu	신월 7 동	Sinwol 7(chil)-dong	0.075	0.014	0.000
233	양천구	Yangcheon-gu	신정 1 동	Sinjeong 1(il)-dong	0.006	0.096	0.000
234	양천구	Yangcheon-gu	신정 2 동	Sinjeong 2(i)-dong	0.011	0.059	0.000

235	양천구	Yangcheon-gu	신정 3 동	Sinjeong 3(sam)-dong	0.004	0.057	0.011
236	양천구	Yangcheon-gu	신정 6 동	Sinjeong 6(yuk)-dong	0.000	0.048	0.000
237	양천구	Yangcheon-gu	신정 7 동	Sinjeong 7(chil)-dong	0.028	0.087	0.000
238	양천구	Yangcheon-gu	목 5 동	Mok 5(o)-dong	0.000	0.026	0.000
239	양천구	Yangcheon-gu	신정 4 동	Sinjeong 4(sa)-dong	0.026	0.081	0.000
240	강서구	Gangseo-gu	염창동	Yeomchang-dong	0.008	0.065	0.006
241	강서구	Gangseo-gu	등촌 1 동	Deungchon 1(il)-dong	0.008	0.099	0.000
242	강서구	Gangseo-gu	등촌 2 동	Deungchon 2(i)-dong	0.002	0.079	0.000
243	강서구	Gangseo-gu	등촌 3 동	Deungchon 3(sam)-dong	0.048	0.150	0.000
244	강서구	Gangseo-gu	화곡본동	Hwagokbon-dong	0.048	0.096	0.013
245	강서구	Gangseo-gu	화곡 2 동	Hwagok 2(i)-dong	0.012	0.087	0.000
246	강서구	Gangseo-gu	화곡 3 동	Hwagok 3(sam)-dong	0.015	0.038	0.000
247	강서구	Gangseo-gu	화곡 4 동	Hwagok 4(sa)-dong	0.017	0.052	0.000
248	강서구	Gangseo-gu	화곡 6 동	Hwagok 6(yuk)-dong	0.053	0.056	0.000
249	강서구	Gangseo-gu	화곡 8 동	Hwagok 8(pal)-dong	0.036	0.027	0.001
250	강서구	Gangseo-gu	가양 1 동	Gayang 1(il)-dong	0.005	0.070	0.000
251	강서구	Gangseo-gu	가양 2 동	Gayang 2(i)-dong	0.000	0.098	0.000
252	강서구	Gangseo-gu	가양 3 동	Gayang 3(sam)-dong	0.000	0.103	0.000
253	강서구	Gangseo-gu	발산 1 동	Balsan 1(il)-dong	0.009	0.078	0.000
254	강서구	Gangseo-gu	공항동	Gonghang-dong	0.066	0.052	0.000
255	강서구	Gangseo-gu	방화 1 동	Banghwa 1(il)-dong	0.038	0.061	0.002
256	강서구	Gangseo-gu	방화 2 동	Banghwa 2(i)-dong	0.100	0.124	0.024
257	강서구	Gangseo-gu	방화 3 동	Banghwa 3(sam)-dong	0.024	0.168	0.024
258	강서구	Gangseo-gu	화곡 1 동	Hwagok 1(il)-dong	0.036	0.068	0.000
259	강서구	Gangseo-gu	우장산동	Ujangsan-dong	0.016	0.022	0.000
260	구로구	Guro-gu	신도림동	Sindorim-dong	0.000	0.060	0.013
261	구로구	Guro-gu	구로 1 동	Guro 1(il)-dong	0.000	0.091	0.036
262	구로구	Guro-gu	구로 3 동	Guro 3(sam)-dong	0.042	0.065	0.136
263	구로구	Guro-gu	구로 4 동	Guro 4(sa)-dong	0.104	0.089	0.013
264	구로구	Guro-gu	구로 5 동	Guro 5(o)-dong	0.063	0.227	0.027
265	구로구	Guro-gu	고척 1 동	Gocheok 1(il)-dong	0.042	0.105	0.016
266	구로구	Guro-gu	고척 2 동	Gocheok 2(i)-dong	0.029	0.151	0.023
267	구로구	Guro-gu	개봉 2 동	Gaebong 2(i)-dong	0.075	0.044	0.020

268	구로구	Guro-gu	개봉 3 동	Gaebong 3(sam)-dong	0.090	0.147	0.033
269	구로구	Guro-gu	오류 1 동	Oryu 1(il)-dong	0.113	0.054	0.000
270	구로구	Guro-gu	수궁동	Sugung-dong	0.058	0.102	0.052
271	구로구	Guro-gu	가리봉동	Garibong-dong	0.065	0.097	0.139
272	구로구	Guro-gu	구로 2 동	Guro 2(i)-dong	0.096	0.143	0.046
273	구로구	Guro-gu	개봉 1 동	Gaebong 1(il)-dong	0.042	0.116	0.001
274	구로구	Guro-gu	오류 2 동	Oryu 2(i)-dong	0.022	0.081	0.043
275	구로구	Guro-gu	항동	Hang-dong	0.000	0.000	0.010
276	금천구	Geumcheon-gu	가산동	Gasan-dong	0.154	0.113	0.000
277	금천구	Geumcheon-gu	독산 1 동	Doksan 1(il)-dong	0.100	0.162	0.006
278	금천구	Geumcheon-gu	독산 2 동	Doksan 2(i)-dong	0.164	0.115	0.000
279	금천구	Geumcheon-gu	독산 3 동	Doksan 3(sam)-dong	0.114	0.133	0.000
280	금천구	Geumcheon-gu	독산 4 동	Doksan 4(sa)-dong	0.142	0.111	0.000
281	금천구	Geumcheon-gu	시흥 1 동	Siheung 1(il)-dong	0.106	0.128	0.012
282	금천구	Geumcheon-gu	시흥 2 동	Siheung 2(i)-dong	0.011	0.100	0.000
283	금천구	Geumcheon-gu	시흥 3 동	Siheung 3(sam)-dong	0.227	0.039	0.000
284	금천구	Geumcheon-gu	시흥 4 동	Siheung 4(sa)-dong	0.265	0.106	0.000
285	금천구	Geumcheon-gu	시흥 5 동	Siheung 5(o)-dong	0.203	0.200	0.000
286	영등포구	Yeongdeungpo-gu	여의동	Yeoui-dong	0.000	0.074	0.010
287	영등포구	Yeongdeungpo-gu	당산 1 동	Dangsan 1(il)-dong	0.143	0.095	0.044
288	영등포구	Yeongdeungpo-gu	당산 2 동	Dangsan 2(i)-dong	0.048	0.072	0.014
289	영등포구	Yeongdeungpo-gu	양평 1 동	Yangpyeong 1(il)-dong	0.044	0.135	0.015
290	영등포구	Yeongdeungpo-gu	양평 2 동	Yangpyeong 2(i)-dong	0.094	0.194	0.000
291	영등포구	Yeongdeungpo-gu	신길 1 동	Singil 1(il)-dong	0.111	0.103	0.048
292	영등포구	Yeongdeungpo-gu	신길 3 동	Singil 3(sam)-dong	0.015	0.119	0.009
293	영등포구	Yeongdeungpo-gu	신길 4 동	Singil 4(sa)-dong	0.053	0.034	0.046
294	영등포구	Yeongdeungpo-gu	신길 5 동	Singil 5(o)-dong	0.040	0.061	0.008
295	영등포구	Yeongdeungpo-gu	신길 6 동	Singil 6(yuk)-dong	0.043	0.057	0.005
296	영등포구	Yeongdeungpo-gu	신길 7 동	Singil 7(chil)-dong	0.026	0.092	0.003
297	영등포구	Yeongdeungpo-gu	대림 1 동	Daerim 1(il)-dong	0.133	0.119	0.025
298	영등포구	Yeongdeungpo-gu	대림 2 동	Daerim 2(i)-dong	0.161	0.280	0.000

299	영등포구	Yeongdeungpo-gu	대림 3동	Daerim 3(sam)-dong	0.149	0.162	0.029
300	영등포구	Yeongdeungpo-gu	영등포본동	Yeongdeungpobon-dong	0.045	0.073	0.059
301	영등포구	Yeongdeungpo-gu	영등포동	Yeongdeungpo-dong	0.029	0.116	0.081
302	영등포구	Yeongdeungpo-gu	도림동	Dorim-dong	0.033	0.098	0.015
303	영등포구	Yeongdeungpo-gu	문래동	Mullae-dong	0.004	0.052	0.011
304	동작구	Dongjak-gu	노량진 2동	Noryangjin 2(i)-dong	0.116	0.120	0.335
305	동작구	Dongjak-gu	상도 1동	Sangdo 1(il)-dong	0.056	0.092	0.023
306	동작구	Dongjak-gu	상도 2동	Sangdo 2(i)-dong	0.068	0.130	0.018
307	동작구	Dongjak-gu	상도 3동	Sangdo 3(sam)-dong	0.024	0.000	0.000
308	동작구	Dongjak-gu	상도 4동	Sangdo 4(sa)-dong	0.072	0.047	0.009
309	동작구	Dongjak-gu	사당 1동	Sadang 1(il)-dong	0.046	0.263	0.024
310	동작구	Dongjak-gu	사당 3동	Sadang 3(sam)-dong	0.008	0.061	0.017
311	동작구	Dongjak-gu	사당 4동	Sadang 4(sa)-dong	0.083	0.021	0.009
312	동작구	Dongjak-gu	사당 5동	Sadang 5(o)-dong	0.037	0.123	0.026
313	동작구	Dongjak-gu	대방동	Daebang-dong	0.040	0.101	0.063
314	동작구	Dongjak-gu	신대방 1동	Sindaebang 1(il)-dong	0.104	0.113	0.066
315	동작구	Dongjak-gu	신대방 2동	Sindaebang 2(i)-dong	0.073	0.032	0.013
316	동작구	Dongjak-gu	흑석동	Heukseok-dong	0.083	0.093	0.000
317	동작구	Dongjak-gu	노량진 1동	Noryangjin 1(il)-dong	0.086	0.112	0.013
318	동작구	Dongjak-gu	사당 2동	Sadang 2(i)-dong	0.023	0.109	0.010
319	관악구	Gwanak-gu	보라매동	Boramae-dong	0.161	0.162	0.000
320	관악구	Gwanak-gu	청림동	Cheongnim-dong	0.072	0.022	0.000
321	관악구	Gwanak-gu	행운동	Haengun-dong	0.051	0.242	0.000
322	관악구	Gwanak-gu	낙성대동	Nagseongdae-dong	0.028	0.223	0.000
323	관악구	Gwanak-gu	중앙동	Jungang-dong	0.079	0.071	0.000
324	관악구	Gwanak-gu	인현동	Inheon-dong	0.071	0.048	0.000
325	관악구	Gwanak-gu	남현동	Namhyeon-dong	0.210	0.128	0.000
326	관악구	Gwanak-gu	서원동	Sewon-dong	0.023	0.007	0.013
327	관악구	Gwanak-gu	신원동	Sinwon-dong	0.017	0.128	0.040
328	관악구	Gwanak-gu	서림동	Serim-dong	0.050	0.166	0.033
329	강남구	Gangnam-gu	신사동	Sinsa-dong	0.193	0.099	0.000
330	관악구	Gwanak-gu	신림동	Sillim-dong	0.095	0.080	0.000
331	관악구	Gwanak-gu	난향동	Nanhyang-dong	0.131	0.107	0.000
332	관악구	Gwanak-gu	조원동	Jowon-dong	0.091	0.076	0.048

333	관악구	Gwanak-gu	대학동	Daehak-dong	0.046	0.219	0.000
334	관악구	Gwanak-gu	은천동	Euncheon-dong	0.078	0.101	0.000
335	관악구	Gwanak-gu	성현동	Seonghyeon-dong	0.054	0.043	0.000
336	관악구	Gwanak-gu	청룡동	Cheongnyeong-dong	0.079	0.144	0.007
337	관악구	Gwanak-gu	난곡동	Nangok-dong	0.052	0.093	0.000
338	관악구	Gwanak-gu	삼성동	Samseong-dong	0.114	0.101	0.000
339	관악구	Gwanak-gu	미성동	Miseong-dong	0.173	0.144	0.000
340	서초구	Seocho-gu	서초 1 동	Seocho 1(il)-dong	0.000	0.061	0.000
341	서초구	Seocho-gu	서초 2 동	Seocho 2(i)-dong	0.000	0.042	0.000
342	서초구	Seocho-gu	서초 3 동	Seocho 3(sam)-dong	0.000	0.026	0.000
343	서초구	Seocho-gu	서초 4 동	Seocho 4(sa)-dong	0.009	0.034	0.000
344	서초구	Seocho-gu	잠원동	Jamwon-dong	0.000	0.034	0.000
345	서초구	Seocho-gu	반포본동	Banpobon-dong	0.000	0.079	0.000
346	서초구	Seocho-gu	반포 1 동	Banpo 1(il)-dong	0.003	0.089	0.000
347	서초구	Seocho-gu	반포 2 동	Banpo 2(i)-dong	0.000	0.011	0.000
348	서초구	Seocho-gu	반포 3 동	Banpo 3(sam)-dong	0.000	0.032	0.000
349	서초구	Seocho-gu	반포 4 동	Banpo 4(sa)-dong	0.000	0.004	0.000
350	서초구	Seocho-gu	방배본동	Bangbaebon-dong	0.000	0.046	0.001
351	서초구	Seocho-gu	방배 1 동	Bangbae 1(il)-dong	0.055	0.105	0.000
352	서초구	Seocho-gu	방배 2 동	Bangbae 2(i)-dong	0.068	0.062	0.000
353	서초구	Seocho-gu	방배 3 동	Bangbae 3(sam)-dong	0.006	0.034	0.000
354	서초구	Seocho-gu	방배 4 동	Bangbae 4(sa)-dong	0.035	0.055	0.004
355	서초구	Seocho-gu	양재 1 동	Yangjae 1(il)-dong	0.020	0.091	0.006
356	서초구	Seocho-gu	양재 2 동	Yangjae 2(i)-dong	0.029	0.162	0.000
357	서초구	Seocho-gu	내곡동	Naegok-dong	0.000	0.000	0.007
358	관악구	Gwanak-gu	신사동	Sinsa-dong	0.000	0.043	0.000
359	강남구	Gangnam-gu	논현 1 동	Nonhyeon 1(il)-dong	0.000	0.220	0.000
360	강남구	Gangnam-gu	논현 2 동	Nonhyeon 2(i)-dong	0.000	0.104	0.000
361	강남구	Gangnam-gu	삼성 1 동	Samseong 1(il)-dong	0.000	0.031	0.023
362	강남구	Gangnam-gu	삼성 2 동	Samseong 2(i)-dong	0.000	0.020	0.000
363	강남구	Gangnam-gu	대치 1 동	Daechi 1(il)-dong	0.000	0.013	0.000
364	강남구	Gangnam-gu	대치 4 동	Daechi 4(sa)-dong	0.000	0.054	0.000
365	강남구	Gangnam-gu	역삼 1 동	Yeoksam 1(il)-dong	0.000	0.047	0.007
366	강남구	Gangnam-gu	역삼 2 동	Yeoksam 2(i)-dong	0.000	0.011	0.012
367	강남구	Gangnam-gu	도곡 1 동	Dogok 1(il)-dong	0.000	0.037	0.005

368	강남구	Gangnam-gu	도곡 2 동	Dogok 2(i)-dong	0.000	0.001	0.000
369	강남구	Gangnam-gu	개포 1 동	Gaepo 1(il)-dong	0.000	0.090	0.000
370	강남구	Gangnam-gu	개포 4 동	Gaepo 4(sa)-dong	0.000	0.134	0.000
371	강남구	Gangnam-gu	일원본동	Irwonbon-dong	0.000	0.058	0.014
372	강남구	Gangnam-gu	일원 1 동	Irwon 1(il)-dong	0.036	0.066	0.000
373	강남구	Gangnam-gu	일원 2 동	Irwon 2(i)-dong	0.013	0.130	0.000
374	강남구	Gangnam-gu	수서동	Suseo-dong	0.000	0.101	0.013
375	강남구	Gangnam-gu	세곡동	Segok-dong	0.000	0.085	0.005
376	강남구	Gangnam-gu	압구정동	Apgujeong-dong	0.000	0.015	0.000
377	강남구	Gangnam-gu	청담동	Cheongdam-dong	0.000	0.032	0.017
378	강남구	Gangnam-gu	대치 2 동	Daechi 2(i)-dong	0.000	0.020	0.000
379	강남구	Gangnam-gu	개포 2 동	Gaepo 2(i)-dong	0.000	0.049	0.000
380	송파구	Songpa-gu	풍납 1 동	Pungnap 1(il)-dong	0.110	0.044	0.000
381	송파구	Songpa-gu	풍납 2 동	Pungnap 2(i)-dong	0.040	0.090	0.000
382	송파구	Songpa-gu	거여 1 동	Geoyeo 1(il)-dong	0.094	0.084	0.021
383	송파구	Songpa-gu	거여 2 동	Geoyeo 2(i)-dong	0.067	0.067	0.000
384	송파구	Songpa-gu	마천 1 동	Macheon 1(il)-dong	0.075	0.034	0.000
385	송파구	Songpa-gu	마천 2 동	Macheon 2(i)-dong	0.185	0.058	0.018
386	송파구	Songpa-gu	방이 1 동	Bangi 1(il)-dong	0.000	0.081	0.020
387	송파구	Songpa-gu	방이 2 동	Bangi 2(i)-dong	0.000	0.047	0.026
388	송파구	Songpa-gu	오륜동	Oryun-dong	0.002	0.045	0.000
389	송파구	Songpa-gu	오금동	Ogeum-dong	0.087	0.092	0.022
390	송파구	Songpa-gu	송파 1 동	Songpa 1(il)-dong	0.006	0.099	0.028
391	송파구	Songpa-gu	송파 2 동	Songpa 2(i)-dong	0.002	0.158	0.026
392	송파구	Songpa-gu	석촌동	Seokchon-dong	0.021	0.142	0.029
393	송파구	Songpa-gu	삼전동	Samjeon-dong	0.005	0.031	0.024
394	송파구	Songpa-gu	가락본동	Garakbon-dong	0.004	0.041	0.033
395	송파구	Songpa-gu	가락 1 동	Garak 1(il)-dong	0.004	0.041	0.015
396	송파구	Songpa-gu	가락 2 동	Garak 2(i)-dong	0.012	0.065	0.014
397	송파구	Songpa-gu	문정 1 동	Munjeong 1(il)-dong	0.009	0.048	0.005
398	송파구	Songpa-gu	문정 2 동	Munjeong 2(i)-dong	0.000	0.040	0.032
399	송파구	Songpa-gu	잠실본동	Jamsilbon-dong	0.004	0.080	0.070
400	송파구	Songpa-gu	잠실 4 동	Jamsil 4(sa)-dong	0.000	0.083	0.000
401	송파구	Songpa-gu	잠실 6 동	Jamsil 6(yuk)-dong	0.000	0.051	0.000
402	송파구	Songpa-gu	잠실 7 동	Jamsil 7(chil)-dong	0.000	0.023	0.016
403	송파구	Songpa-gu	잠실 2 동	Jamsil 2(i)-dong	0.000	0.034	0.005
404	송파구	Songpa-gu	잠실 3 동	Jamsil 3(sam)-dong	0.003	0.031	0.004
405	송파구	Songpa-gu	장지동	Jangji-dong	0.016	0.091	0.017

406	송파구	Songpa-gu	위례동	Wirye-dong	0.000	0.073	0.018
407	강동구	Gangdong-gu	강일동	Gangil-dong	0.018	0.040	0.015
408	강동구	Gangdong-gu	상일동	Sangil-dong	0.010	0.050	0.000
409	강동구	Gangdong-gu	명일 1 동	Myeongil 1(il)-dong	0.047	0.068	0.000
410	강동구	Gangdong-gu	명일 2 동	Myeongil 2(i)-dong	0.000	0.038	0.015
411	강동구	Gangdong-gu	고덕 1 동	Godeok 1(il)-dong	0.013	0.050	0.000
412	강동구	Gangdong-gu	고덕 2 동	Godeok 2(i)-dong	0.045	0.058	0.016
413	강동구	Gangdong-gu	암사 2 동	Amsa 2(i)-dong	0.031	0.167	0.001
414	강동구	Gangdong-gu	암사 3 동	Amsa 3(sam)-dong	0.022	0.033	0.000
415	강동구	Gangdong-gu	천호 1 동	Cheonho 1(il)-dong	0.047	0.075	0.000
416	강동구	Gangdong-gu	천호 3 동	Cheonho 3(sam)-dong	0.039	0.061	0.000
417	강동구	Gangdong-gu	성내 1 동	Seongnae 1(il)-dong	0.027	0.141	0.019
418	강동구	Gangdong-gu	성내 2 동	Seongnae 2(i)-dong	0.080	0.072	0.000
419	강동구	Gangdong-gu	성내 3 동	Seongnae 3(sam)-dong	0.071	0.006	0.000
420	강동구	Gangdong-gu	둔촌 1 동	Dunchon 1(il)-dong	0.000	0.268	0.000
421	강동구	Gangdong-gu	둔촌 2 동	Dunchon 2(i)-dong	0.050	0.102	0.000
422	강동구	Gangdong-gu	암사 1 동	Amsa 1(il)-dong	0.041	0.049	0.014
423	강동구	Gangdong-gu	천호 2 동	Cheonho 2(i)-dong	0.101	0.095	0.005
424	강동구	Gangdong-gu	길동	Gil-dong	0.149	0.090	0.000

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국문 초록

보편적 돌봄을 위한 서울시 초등돌봄시설의 공간 분포 및 불균형 분석

최근 보편적 돌봄에 대한 사회적 관심이 높아짐에 따라 보편적 돌봄이 돌봄 격차로 인한 사회적 불평등과 잠재적인 사회적 비용을 줄이는 데 효과가 있음을 보여주는 연구들이 등장하였다. 국내에서는 2004년 아동복지법 개정과 2005년 저출산·고령화사회기본법 시행을 통해 보편적 아동 돌봄이 전개되었다. 하지만, 아직까지 보편적 돌봄 서비스에 대한 지역 접근성 관한 연구는 부족하다. 따라서 본 연구는 서울시 전역의 초등돌봄시설의 서비스 접근성을 측정하고, 공급 과잉 또는 과소 지역을 분석하며, 지역적 특성과 돌봄 접근성의 관계를 조사하였다. 연구결과는 다음과 같다. 돌봄 접근성의 공간적 분포가 지역의 경제적 수준과 상응하지만, 돌봄 접근성은 자녀를 가진 가족 인구에 반대된다. 또한, 서울시의 전반적인 돌봄 접근성은 범정부 돌봄수요에서 조사된 수요 비율에 훨씬 미치지 못한다. 마지막으로, 모든 지역적 특성 중 아동 인구와 공시 지가 지수는 돌봄 접근성에 유의미한 부적 관계를 가지고 있으며, 국민기초생활보장 수급자 인구는 접근성에 유의미한 정적 관계를 가지고 있다. 본 연구는 미시적 공간 분석을 통해 보편적 돌봄의 서비스 지역 내 세부 수요 집단을 측정하여 보다 면밀한 공간 접근성을 추정하고 보편적 돌봄과 접근성이라는 서로 다른 분야의 주제를 함께 연구함에 의의를 가지고 있다. 또한, 본 연구는 서울의 보편적 돌봄 접근성의 현재 지형에 대한 포괄적인 이해를 제공한다.

주요어: 보편적 돌봄, 공간 접근성, Two-Step Floating Catchment Area (2SFCA), 사회 서비스의 공간 분석, 사회 인프라 계획, 초등 돌봄

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