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# Is Proximity to Parks Associated with Physical Activity and Well-Being? Insights from 15-Minute Parks Policy Initiative in Bangkok, Thailand

**Sigit D. Arifwidodo [1,2,*], Orana Chandrasiri [2] and Putthipanya Rueangsom [2]**

[1] Department of Landscape Architecture, Faculty of Architecture, Kasetsart University, Bangkok 10900, Thailand

[2] Activethai.org Research Center, Faculty of Architecture, Kasetsart University, Bangkok 10900, Thailand; orana.chandrasiri@gmail.com (O.C.); p.rueangsom@gmail.com (P.R.)

* Correspondence: sigit.d@ku.ac.th

**Abstract**

The proximity of urban green spaces to residential areas has become a central principle in contemporary urban planning, with cities worldwide adopting "15-minute city" concepts that prioritize walking-distance access to parks. This study examined whether proximity to different types of parks influences park visitation, physical activity, and mental well-being in Bangkok, Thailand, where the government recently launched a 15-minute parks policy initiative to improve the proximity of urban residents to green spaces. Using a cross-sectional survey of 615 residents across Bangkok's 50 districts, we measured proximity to six park types using GIS network analysis and assessed health outcomes through validated instruments (Global Physical Activity Questionnaire, GPAQ for physical activity GPAQ for physical activity, and WHO-5 for well-being). Our findings revealed that only proximity to community parks (5–20 ha) was significantly associated with park visitation, sufficient physical activity, and good well-being. Proximity to smaller parks, including the new 15-minute parks, pocket parks, and neighborhood parks, showed no significant associations with any health outcomes, despite being within walking distance. These results suggest a critical size threshold below which parks cannot generate health and well-being benefits in Bangkok's environment. The findings challenge the argument commonly used in proximity-based green space policies that assume closer parks automatically improve park visitation and public health benefits, indicating that cities facing similar constraints should balance between providing small park networks and securing larger, functional parks to support meaningful recreational use or health improvements.

**Keywords:** urban parks; physical activity; well-being; park proximity; Bangkok; 15-minutes parks; green space planning

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## 1. Introduction

The proximity of urban green spaces to residential areas has emerged as a central principle in contemporary urban planning, with mounting evidence suggesting that nearby parks can significantly influence public health outcomes [1–3]. This proximity-focused approach assumes that reducing distance barriers between residents and green spaces will translate into increased park use, higher physical activity levels, and improved mental well-being [4,5]. However, critical questions remain about whether proximity alone is sufficient to generate these health benefits, particularly in high-density urban environments where park characteristics, urban design, and cultural factors may moderate or even override the effects of distance [6,7].

Recent studies have demonstrated that parks provide differential benefits across population groups and activity types. For instance, Gao et al. [8] found that park quality and specific environmental characteristics—beyond mere greenness—significantly influence children's moderate-to-vigorous physical activity levels. Similarly, Bao et al. [9] revealed that children's physical activity in parks is strongly associated with perceived park characteristics, including safety, facility diversity, and maintenance quality. These findings suggest that the relationship between parks and physical activity is mediated by complex interactions between park attributes and user demographics, challenging simplistic proximity-based planning approaches that treat all parks as functionally equivalent.

The global adoption of "15-minute city" concepts has accelerated the implementation of proximity-based green space policies, with cities worldwide setting ambitious targets for park accessibility within walking distance [10]. These policies typically define success by ensuring residents live within a specific distance threshold, usually 400–800 m from a park, regardless of park size or characteristics [11]. Yet emerging evidence suggests that the relationship between park proximity and health outcomes is more complex than simple distance metrics imply. Park size, quality, amenities, and the configuration of the broader park system may be equally or more important determinants of whether proximate green spaces actually improve population health [12,13].

International implementations of proximity-based park policies reveal diverse approaches and implicit assumptions about how distance interacts with other park characteristics. Paris's "15-minute city" ensures proximate access to small parks while maintaining larger destination parks, suggesting that proximity and park hierarchy work synergistically [14]. Melbourne's "20-minute neighborhoods" policy mandates that 95% of residents live within 400 m of public green space but explicitly maintains a range of park sizes to serve different recreational needs [15]. Singapore's "Green Plan 2030" targets a 10-minute walk to parks for every household while investing heavily in park quality and interconnected park networks [16]. These examples share a common recognition that proximity represents just one dimension of effective green space planning.

The health impacts of proximity to different park types remain empirically uncertain, particularly for small parks (<0.5 ha) that often form the backbone of proximity-based policies. While small "pocket parks" can be implemented quickly in dense urban areas with limited available land, research yields mixed findings about their effectiveness in promoting physical activity and mental well-being [17,18]. On the other hand, studies consistently show that park size moderates health outcomes, with larger parks (≥5 ha) demonstrating stronger associations with sustained moderate-to-vigorous physical activity (MVPA) and psychological restoration compared to smaller spaces [19,20]. These size effects likely reflect multiple mechanisms: larger parks accommodate diverse activities, provide greater separation from urban stressors, offer more immersive natural environments, and encourage longer visits [21,22].

Bangkok, Thailand, presents an ideal setting to examine how park proximity operates in a non-Western, tropical megacity context. The city faces severe green space constraints that mirror challenges across rapidly urbanizing Asia [23]. Bangkok's tropical climate, with extreme heat and humidity, creates unique barriers to outdoor activity that may alter how proximity influences park use [24]. Cultural preferences for air-conditioned spaces, concerns about air pollution, and limited pedestrian infrastructure further complicate the assumed relationship between living near a park and actually using it [25].

In response to these challenges, the Bangkok Metropolitan Administration (BMA) launched an ambitious "15-minute parks policy" in 2023, committing to establish 500 small parks within 800 m walking distance of all residents by 2026 [26]. This policy represents a significant test of proximity-based planning principles: can ensuring nearby access to small parks overcome the multiple barriers to outdoor activity in Bangkok's challenging urban environment? Unlike cities that balance proximity goals with park hierarchy, Bangkok's land constraints and costs have necessitated an almost exclusive focus on small parks, making it a natural experiment in proximity-first planning.

Bangkok's existing park system already includes pocket parks, neighborhood parks, community parks, and a few large district and city parks [27]. The new 15-minute parks essentially represent enhanced pocket parks with improved amenities but similar size constraints. This creates an opportunity to examine not just whether proximity to the new 15-minute parks influences health outcomes, but how proximity effects vary across the entire park hierarchy and whether synergies exist when residents have proximate access to multiple park types.

Despite substantial public investment in the 15-minute parks policy, no empirical evaluation has tested whether proximity to small parks improves health outcomes in Bangkok's context. This evidence gap has critical implications, as similar proximity-focused policies are being rapidly adopted across Southeast Asia based on assumptions in Western models of park proximity and park use model that apply universally. Understanding how proximity operates in different urban contexts, and whether proximity alone is sufficient in Bangkok urban environments, is essential for evidence-based green space planning.

This study addresses these knowledge gaps through a comprehensive examination of park proximity effects in Bangkok. Specifically, we investigate (1) How proximity to different types of parks, including the 15-minute parks influences park visitation patterns in Bangkok's urban context; and (2) Whether proximity to parks, including the 15-minute parks is associated with meeting WHO physical activity guidelines (≥150-min/week) and good well-being (WHO-5 ≥ 50). By examining proximity effects across Bangkok's entire park hierarchy while evaluating the new 15-minute parks policy, this research provides evidence for urban planners in dense, climatically challenging cities. For Bangkok, the findings will inform whether continued investment in proximity-focused small parks is justified, or whether resources should shift toward securing larger parks or creating integrated park networks. For the international community, this study tests the universality of proximity-based green space planning assumptions and identifies conditions under which distance to parks does—or does not—translate into public health benefits. As cities worldwide adopt a proximity approach in green space provision without considering local contexts, evidence from diverse urban environments becomes essential for developing culturally and environmentally appropriate strategies.

## 2. Materials and Methods

### 2.1. Study Area

Bangkok, Thailand's capital and largest city, encompasses 1569 square kilometers with a population exceeding 8 million residents [25]. The city's rapid urbanization and high-density development have created significant challenges for urban green space provision. Bangkok's tropical climate, characterized by high temperatures (averaging 28–35 °C year-round), elevated humidity (70–85%), and a distinct rainy season, presents unique conditions that may influence how proximity to parks translates into actual park use and health benefits [28].

The Bangkok Metropolitan Administration (BMA) manages a hierarchical park system comprising five traditional categories based on size: pocket parks (<0.5 ha), neighborhood parks (0.5–5 ha), community parks (5–20 ha), district parks (20–100 ha), and city parks (>100 ha) [25,26]. This system currently includes 1139 neighborhood parks, 104 community parks, 20 district parks, and 2 city parks, with pocket parks distributed throughout the city. In 2023, the BMA initiated the "15-minute parks" program designed specifically to promote physical activity and mental well-being within 800 m walking distance of residential areas [24]. These 15-minute parks, while similar in size to traditional pocket parks, feature upgraded amenities including exercise equipment, shaded seating areas, walking paths, and improved lighting [29]. Table 1 summarizes the characteristics of different park types. Figure 1 shows the spatial distribution of the public parks in Bangkok used in the study.

**Table 1.** Summary of park types characteristics in Bangkok.

| Park Type | Purpose | Area (sq.m) (Mean/Median) | Typical Features |
|---|---|---|---|
| City Park (*n* = 2) | Serve entire city population, provide large-scale recreation, ecological conservation, and venues for major events. Offering diverse exercise, recreation and leisure activities. | 1,161,422/1,161,422 | Vast natural areas and forests, large lakes, cultural centers, national monuments, running/biking track, and other features that are commonly found in other smaller park types. |
| District Park (*n* = 20) | District-wide destination and serve residents of a district, offering diverse exercise, recreation and leisure activities. | 415,920/354,448 | Large sports complexes, running/biking tracks, swimming pools, museums, extensive botanical gardens, and other features that are commonly found in other smaller park types. |
| Community Park (*n* = 104) | Provide everyday exercise, recreation and social spaces for communities and several adjacent neighborhoods. | 70,638/61,862 | Jogging tracks, multi-sports courts, playgrounds, picnic lawns, fitness stations, water features. |
| Neighborhood Park (*n* = 1139) | Offer quick access to green relief and play for residents within neighborhood and facilitate regular exercise, provide play areas for children. | 10,388/7488 | Play structures, benches, shade trees, Jogging tracks, playgrounds, outdoor exercise equipment, open lawns. |
| Pocket Park (*n* = 4920) | Inserted in dense blocks to enhance streetscape and microclimate. | 1112/738 | Seating nooks, landscaping, art, shade trees, sometimes small play or fitness elements. |
| 15-Minute Park (*n* = 196) * | Ensure every resident has a park within a 15-minute walk, improving equitable access to green space, increase opportunities for physical activity and well-being. | 3003/957 | Flexible: seating, shade, walking loops, play areas, community gardens. |

Sources: adapted and summarized from Bangkok Metropolitan Administration [25,26,29]. * = the number of 15-minute parks operational as of June 2024 [30].

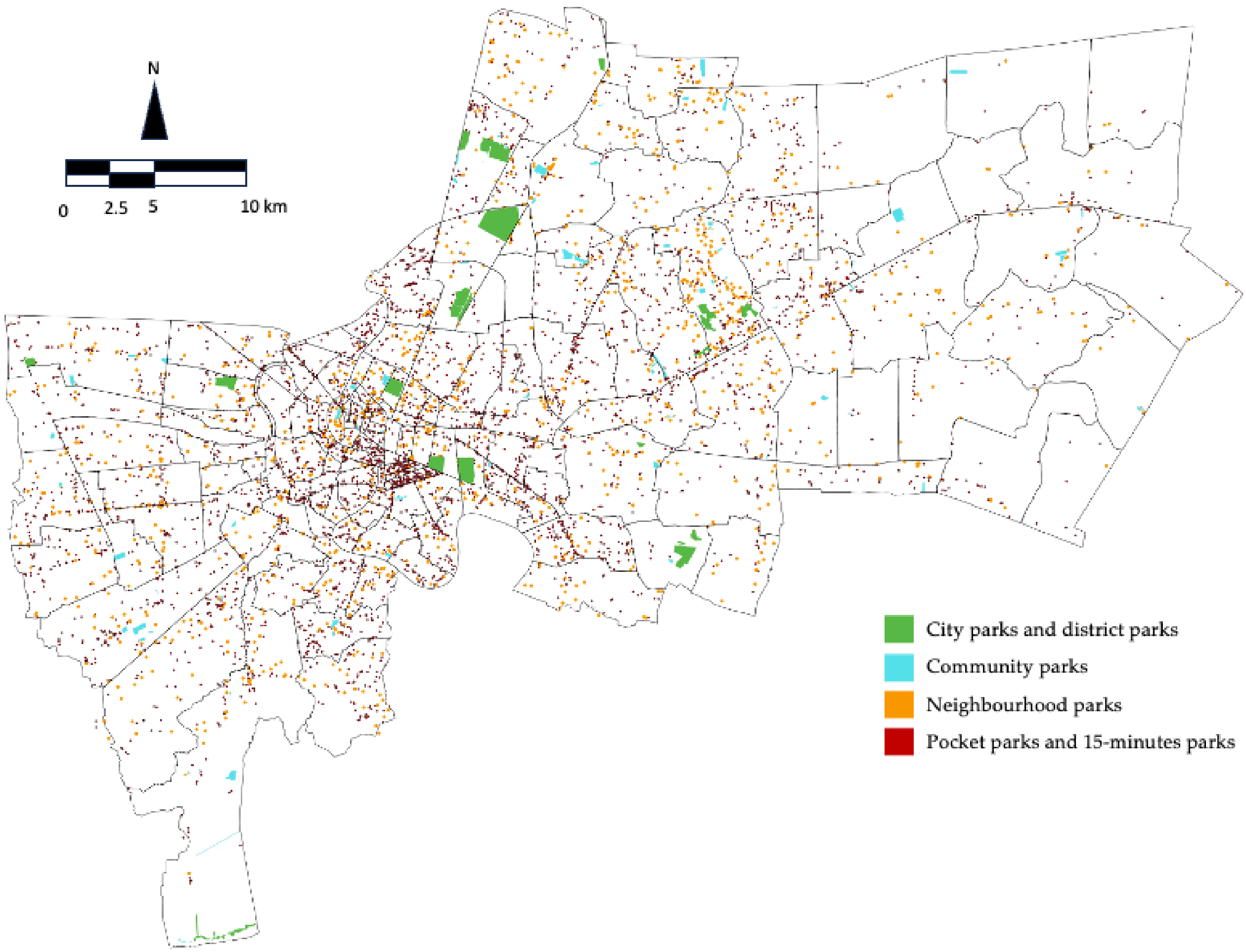


**Figure 1.** Spatial distribution of public park in Bangkok used in the study. Sources: adapted and summarized from Bangkok Metropolitan Administration [25–27].

## 2.2. Study Design

This study focused on examining parks under the BMA, which encompassed six categories of parks. A quota sampling design was employed, with participants selected from Bangkok's 50 administrative districts. To ensure adequate representation while accounting for potential non-response, we targeted 700 participants (14 per district). This approach follows precedent from previous Bangkok-based physical activity and health studies that demonstrated effectiveness in minimizing selection bias while maintaining geographic representativeness [8,31]. Potential participants were randomly selected from the BMA's household registration database within each district, with replacement sampling when initial contacts were unavailable or declined participation. Inclusion criteria for the respondents were (1) age more than 18 years, (2) Bangkok residence for ≥12 months, (3) ability to walk independently, and (4) provision of informed consent. Exclusion criteria included: (1) pregnancy, (2) serious medical conditions limiting physical activity, (3) cognitive impairment affecting questionnaire completion, and (4) temporary residence status.

Data collection occurred between 2 July and 31 August 2024, utilizing face-to-face interviews conducted by ten trained surveyors. To minimize seasonal bias, data collection was distributed evenly across the study period, with equal numbers of interviews conducted weekly. Interviews were conducted throughout the day (8 a.m. to 6 p.m.) to capture respondents with varying daily schedules and park visitation patterns. While recent literature highlights the importance of night-time park use in tropical regions for psychological restoration [32,33], parks in Bangkok typically close at 9 p.m., with usage declining significantly after 7 p.m. due to inadequate lighting infrastructure and safety concerns. This operational constraint effectively limits regular night time park use in our study context. Weather conditions (temperature, humidity, precipitation) were recorded daily during the data collection period. It was mostly clear weather during July and August, with daily average temperatures around 30 degrees Celsius (26–32 degrees Celsius). Weather conditions (temperature, humidity, precipitation) were recorded daily during the data collection period to assess potential confounding effects. Participants received a compensation of 100 Thai baht (approximately USD 3) for their time. After exclusion of incomplete or inconsistent questionnaires, the final sample comprised 615 valid responses after data cleaning. The study protocol received approval from the Institutional Review Board of the Institute for the Development of Human Research Protection (IHRP), Thailand. After data cleaning and removal of incomplete responses ($n$ = 85), the final analytical sample comprised 615 participants.

### *2.3. Variables and Measurement*

The survey questionnaire comprised 58 items organized into four sections administered through face-to-face interviews in Thai language. Section 1 collected socioeconomic characteristics including monthly household income, education level, gender, marital status, and presence of children. Section 2 assessed health-behavior variables: current smoking status, regular alcohol consumption, self-reported height and weight for BMI calculation, and diagnosis of non-communicable diseases ('Have you been diagnosed with diabetes, hypertension, heart disease, or stroke by a doctor?'). Section 3 addressed park visitation using pre-identified park names from our GIS analysis and the time of visitation (morning/evening). Section 4 incorporated three validated instruments: the 16-item Global Physical Activity Questionnaire (GPAQ) measuring work, transport, and recreational activity domains; the 5-item WHO-5 Well-being Index; and the 24-item Abbreviated Neighborhood Environment Walkability Scale (NEWS-A) assessing perceived residential density, land-use mix, street connectivity, walking infrastructure, and safety. All validated instruments underwent pilot testing among 30 Bangkok residents, confirming comprehension and cultural appropriateness. The complete survey required 25–35 min to administer, with responses recorded on paper. The questionnaire's reliability was verified through Cronbach's alpha analysis, yielding values between 0.78 and 0.91, indicating strong internal consistency.

Park proximity, the primary exposure variable, was systematically measured using geographic information system (GIS) analysis. Each respondent's residential address from the survey was geocoded. Park locations were obtained from the official BMA database, which includes detailed polygon features of all public parks. The park proximity measurement followed a two-step process. First, the shortest path distance between each respondent's residence and the nearest point of each park's boundary was calculated in QGIS 3.34, accounting for the actual street network rather than straight-line distance. This approach provides a more accurate representation of the real-world walking distance compared to simple Euclidean measurements [34]. Second, a 15-minute threshold (equivalent to approximately 800 m) was selected based on the alignment with Bangkok's 15-minute parks policy. This definition was applied consistently across all park types (15-minute parks, pocket parks, neighborhood parks, community parks, and district/urban parks) to create binary proximity variables (yes/no) called whether the respondents live in proximity to each park type.

Park visitation was measured through a systematic multi-step process. First, each respondent's residential address was geocoded in QGIS. Second, we identified all parks within the 800 m network distance threshold, recording each park's name and type. Third, during the face-to-face interview, we asked respondents about each identified park: "Did you visit [specific park name] in the past week?" (Yes/no). If respondents visited any park within the threshold, they were coded as having visited a park.

Physical activity was measured using the Global Physical Activity Questionnaire (GPAQ), developed by the World Health Organization [35]. The GPAQ quantifies activity across three domains: work-related activity, transportation-related activity, and recreational activity. Physical activity levels were categorized as sufficient (≥150 min/week) or insufficient (<150 min/week) based on WHO's 2020 guidelines for physical activity and sedentary behavior [35]. The GPAQ was administered by an interviewer and tailored to fit the Thai context based on previous studies conducted in Thailand [26,30].

Mental well-being was evaluated using the 5-item World Health Organization Well-Being Index (WHO-5). This validated instrument assesses subjective well-being over a two-week period using a 6-point Likert scale, with total scores ranging from 0 to 100 [36]. Scores below 50 indicate poor well-being and suggest potential depression symptoms [37].

Neighborhood walkability was incorporated into the analysis using the Abbreviated Neighborhood Environment Walkability Scale (NEWS-A), a validated 24-item instrument that captures perceived residential density, land-use mix, street connectivity, infrastructure for walking/cycling, and safety. NEWS-A has shown robust factorial and criterion validity across cultures and age groups [38] and was recently applied in Bangkok, where higher walkability scores predicted both recreational walking and overall physical activity [36,39]. We therefore treated NEWS-A as a key covariate for two reasons: (i) neighborhoods with permeable street networks and mixed land uses are more likely to contain (or be planned alongside) small green spaces, making walkability a potential confounder of the relationship between park proximity and health outcomes; and (ii) a highly walkable environment can amplify the functional reach of a nearby park, whereas poor walkability may nullify an otherwise "close" park. The NEWS-A total scores were calculated by summing all item responses, with possible scores ranging from 24 to 96. We dichotomized walkability using a median split approach (median = 58), where scores ≥ 58 were classified as "high walkability" and scores < 58 as "low walkability", consistent with previous Bangkok studies [30,36,39].

The study also collected data on several potential confounding factors, including health-related variables such as non-communicable diseases (NCDs) [40], smoking status [41], alcohol consumption [42], and Body Mass Index (BMI) [43]. Additionally, sociodemographic variables including income, education level, sex, marital status, presence of children, and occupation were collected, as these factors have been shown to influence park visitation and physical activity patterns [44,45].

### *2.4. Data Analysis*

Data analysis employed three multivariable logistic regression models. Model 1 examined park visitation as the dependent variable, with park proximity and park type as key independent variables. The dependent variable was a binary measure of park visitation, based on the survey question: "Did you visit the park near your home in the past week?" (1 = Yes, 0 = No).

Model 2 analyzed physical activity. The dependent variable was binary sufficient physical activity (1 = ≥150 min/week of moderate-to-vigorous physical activity, 0 = <150 min/week), based on WHO's 2020 guidelines (https://iris.who.int/bitstream/handle/10665/336656/9789240015128-eng.pdf?sequence=1, accessed on 11 August 2025) for physical activity and sedentary behavior, measured using the Global Physical Activity Questionnaire (GPAQ). Independent variables included the same park proximity indicators as Model 1. Additionally, park visitation (binary: visited park in past week) was included as a potential mediating variable to examine whether the effects of park proximity on physical activity operate through increased park use.

Model 3 assessed mental well-being using the WHO-5 index score as the dependent variable (categorized into good well-being $\geq 50$ and poor well-being $< 50$), similarly incorporating park proximity and visitation as independent variables. All models were adjusted for potential confounding factors, including socioeconomic characteristics (income, education, marital status), demographics (sex, presence of children), health-related factors (BMI, smoking status, alcohol consumption, non-communicable diseases), and neighborhood walkability (NEWS-A score dichotomized as high/low).

To assess the robustness of our findings, we conducted sensitivity analyses using alternative distance thresholds: (1) 400 m, representing immediate neighborhood access (approximately a 7-minute walk in Bangkok's climate), testing whether very close proximity yields stronger health benefits; (2) 1000 m, which is based on the common threshold used in studies in the US and European countries for walking distance, examining whether Bangkok's policy standard might be overly conservative [46,47]. For each threshold, we replicated all three primary analyses (park visitation, physical activity, and well-being) using identical model specifications and covariates. This approach allowed us to examine whether our models were robust to different operational definitions of "proximity" or were artifacts of the specific 800 m cutoff. Additionally, sensitivity analyses tested whether distance-decay patterns varied by park type, providing insights into the functional catchment areas of different parks in Bangkok's urban context [48,49].

All analyses were performed using JAMOVI version 2.5.1 [50,51]. Variance Inflation Factors (VIFs) were calculated to check for multicollinearity among predictor variables, with all values below 5 indicating acceptable collinearity levels. Model fit was assessed using the omnibus test and Nagelkerke $R^2$. Results are presented as odds ratios (ORs) with 95% confidence intervals (CIs), with $p$-values $< 0.05$ considered statistically significant.

## 3. Results

Table 2 summarizes the characteristics of the respondents. Overall, the respondent profile skews slightly female (57%), with roughly half declaring monthly household incomes below 10,000 THB (≈300 USD) and a comparable share above 30,000 THB, indicating a socio-economically mixed sample; education levels are similarly diverse, though nearly three-quarters (74%) completed at least secondary schooling. Most participants are single (52%), child-free (56%), and of normal weight (BMI $\leq$ 25, 59%). Health-related behaviors are generally favorable, only 13% report regular alcohol use, and just under half smoke, yet chronic conditions are rare (3%). Despite this, lifestyle indicators reveal constraints: perceived neighborhood walkability is low for 53% of respondents, four in five fall short of the WHO-recommended 150 min of weekly physical activity, and 80% score below 50 on the WHO-5 well-being index, signaling diminished mental well-being. The GIS network analysis of respondents' geocoded residential addresses revealed differential access to park types across Bangkok. Among the 615 participants, 34.6% lived within 800 m walking distance of a pocket park, 25.2% had access to a 15-minute park, 29.8% were proximate to a neighborhood park, and 22.1% lived within walking distance of a community park. No respondents in our sample lived within 800 m of district or city parks, reflecting their limited number ($n$ = 22 total) and concentration in specific areas. Notably, no respondents lived within 800 m of multiple 15-minute parks, which simplified our park visitation analysis. The spatial distribution showed that despite Bangkok's 196 operational 15-minute parks and 4920 pocket parks, the majority of respondents (74.8% and 65.4%, respectively) did not have walking-distance access to these park types, highlighting persistent gaps in park coverage even after recent policy initiatives.

**Table 2.** Characteristics of the respondents in the study.

| Category | Variable | Sample Characteristics |
|---|---|---|
| Socioeconomic characteristics | Monthly income | |
| | Less than 5000 THB (less than 160 USD) | 20.5% |
| | 5000–10,000 THB (160–300 USD) | 22.9% |
| | 10,001–30,000 THB (300–1000 USD) | 16.7% |
| | 30,001–50,000 THB (1000–1600 USD) | 20.0% |
| | More than 50,000 THB | 19.8% |
| | Education | |
| | Below secondary education | 25.9% |
| | Secondary education | 37.7% |
| | Above secondary education | 36.4% |
| | Gender | |
| | Male | 42.6% |
| | Female | 57.4% |
| | Marital Status | |
| | Single | 51.5% |
| | Living with partner | 48.5% |
| | BMI | |
| | 25 or less | 58.5% |
| | >25 | 41.5% |
| | Having children | |
| | Yes | 44.2% |
| | No | 55.8% |
| Healthy behavior | Regular alcohol consumption | |
| | Yes | 12.8% |
| | No | 87.2% |
| | Regular smokers | |
| | Yes | 48.9% |
| | No | 51.1% |
| | Having non-communicable diseases (NCDs) | |
| | Yes | 3.4% |
| | No | 96.6% |
| Neighborhood walkability | NEWS-A score | |
| | High | 47.5% |
| | Low | 52.5% |

**Table 2.** *Cont.*

| Category | Variable | Sample Characteristics |
|---|---|---|
| Physical activity | Physical activity level | |
| | Physically active (>150 min/week) | 20.3% |
| | Insufficient physical activity (<150 min/week) | 79.7% |
| Well-being | WHO-5 scores | |
| | >50 | 19.7% |
| | <50 | 80.3% |
| Proximity to park | Living near pocket park | |
| | Yes | 34.6% |
| | No | 65.4% |
| | Living near 15-minutes park | |
| | Yes | 25.2% |
| | No | 74.8% |
| | Living near neighborhood park | |
| | Yes | 29.8% |
| | No | 70.2% |
| | Living near community park | |
| | Yes | 22.1% |
| | No | 77.9% |
| Park visitation | Visiting the nearest park in the last week | |
| | Yes | 51.1% |
| | No | 48.9% |

Table 3 summarizes the association between park visitation and park proximity. In the multivariable logistic regression model that included sociodemographic factors, health behaviors, BMI, and other covariates as control variables, only two environmental attributes showed statistically significant associations with park visitation in the past week. Residents living within the service area of a community-sized park were more than twice as likely to report a recent visit compared with those without such access (OR = 2.367, 95% CI 1.511–3.154, $p < 0.005$). Likewise, perceiving one's neighborhood as highly walkable (high NEWS-A score) was associated with park visitation (OR = 1.688, 95% CI 1.190–2.847, $p < 0.005$). In contrast, proximity to pocket parks, 15-minute parks, or neighborhood parks showed positive but statistically non-significant associations. Overall model diagnostics indicated acceptable goodness-of-fit ($\chi^2$ (20) = 52.5, $p < 0.005$) and modest explanatory power (Nagelkerke $R^2 = 0.19$) with low multicollinearity (VIF = 1.14–2.73), supporting the robustness of the main effects observed.

Table 4 summarizes the association between park proximity and physical activity and well-being. Among the different park categories examined, living near community parks demonstrated the strongest positive association with both physical activity (OR = 2.417, 95% CI: 1.213–4.820, $p < 0.005$) and well-being (OR = 2.211, 95% CI: 1.108–4.410, $p < 0.005$), indicating that residents with access to community parks were approximately twice as likely to engage in physical activity and report higher well-being compared to those without such access. Conversely, proximity to pocket parks showed a negative association with both outcomes, though these relationships were not statistically significant. Neighborhood walkability emerged as the most influential factor, with high NEWS-A scores associated with substantially increased odds of physical activity (OR = 5.297, 95% CI: 3.255–8.62) and well-being (OR = 5.453, 95% CI: 3.321–8.95). Additionally, recent park visitation behavior was significantly associated with positive outcomes, with individuals who visited their nearest park in the previous week showing more than double the odds of engaging in physical activity (OR = 2.640, 95% CI: 1.635–4.26) and reporting higher well-being (OR = 2.370, 95% CI: 1.465–3.83). Both models demonstrated good fit statistics (Nagelkerke $R^2$ = 0.246 for physical activity; $R^2$ = 0.240 for well-being) and acceptable multicollinearity levels (VIF < 3.0), suggesting robust analytical validity after controlling for potential confounding variables including sociodemographic characteristics, health behaviors, and health status.

**Table 3.** Association between park visitation and proximity to parks.

| Category | Variable | OR | 95% CI |
|---|---|---|---|
| Proximity to park | Living near pocket park | | |
| | No | ref | |
| | Yes | 0.912 | 0.505–1.645 |
| | Living near 15-minutes park | | |
| | No | ref | |
| | Yes | 1.288 | 0.675–2.459 |
| | Living near neighborhood park | | |
| | No | ref | |
| | Yes | 1.280 | 0.823–1.991 |
| | Living near community park | | |
| | No | ref | |
| | Yes | 1.841 * | 1.191–2.847 |
| Neighborhood walkability | NEWS-A score | | |
| | Low | ref | |
| | High | 1.688 * | 1.190–2.847 |

Note: the model was adjusted for income, education, gender, marital status, BMI, children in household, smoking, alcohol use, having NCDs, and neighborhood walkability. $\chi^2$ = 52.5, df = 20, $p$ < 0.005. Nagelkerke $R^2$ = 0.19. VIF = 1.14–2.73. * = $p$ < 0.005.

Table 5 presents the results of the sensitivity analysis. Across all distance thresholds tested, the pattern remained remarkably consistent: proximity to community parks was the only park type showing significant associations with physical activity and well-being outcomes, while proximity to smaller park types showed no significant effects regardless of distance threshold. At the 400 m threshold, community parks showed the strongest associations across all outcomes. All smaller park types, pocket parks, 15-minute parks, and neighborhood parks showed no significant associations with any outcome at 400 m, despite this representing a 5–7-min walk. At the 1000 m threshold, community parks maintained significant associations with park visitation, physical activity, and well-being. The gradual attenuation in effect sizes from 400 m through 800 m to 1000 m demonstrates a modest distance-decay pattern while confirming that community park benefits extend well beyond immediate proximity.

**Table 4.** Association between park proximity and physical activity and well-being.

| Category | Variable | Physical Activity | | Well-Being | |
|---|---|---|---|---|---|
| | | OR | 95% CI | OR | 95% CI |
| Proximity to park | Living near pocket park | | | | |
| | No | ref | | ref | |
| | Yes | 0.614 | 0.285–1.320 | 0.690 | 0.250–1.18 |
| | Living near 15-minute park | | | | |
| | No | ref | | ref | |
| | Yes | 1.803 | 0.780–4.170 | 1.468 | 0.621–3.470 |
| | Living near neighborhood park | | | | |
| | No | ref | | ref | |
| | Yes | 1.738 | 0.996–3.030 | 1.708 | 0.975–2.990 |
| | Living near community park | | | | |
| | No | ref | | ref | |
| | Yes | 2.417 * | 1.213–4.820 | 2.211 * | 1.108–4.410 |
| Neighborhood walkability | NEWS-A score | | | | |
| | Low | ref | | ref | |
| | High | 5.297 * | 3.255–8.62 | 5.453 * | 3.321–8.95 |
| Park visitation | Visiting nearest park last week | | | | |
| | No | | | | |
| | Yes | 2.640 * | 1.635–4.26 | 2.370 * | 1.465–3.83 |

Note: * = $p < 0.005$. Both models were adjusted for income, education, gender, marital status, BMI, children in household, smoking, alcohol use, having NCDs, and neighborhood walkability. Physical activity model: $\chi^2 = 105$, df = 21, $p < 0.005$. Nagelkerke $R^2 = 0.246$. VIF = 1.14–2.74. Well-being model: $\chi^2 = 101$, df = 21, $p < 0.005$. Nagelkerke $R^2 = 0.240$. VIF = 1.14–2.85.

**Table 5.** Sensitivity analysis: park proximity at different distance thresholds.

| Park Type | Distance | Park Visitation | Physical Activity | Well-Being |
|---|---|---|---|---|
| | | OR (95% CI) | OR (95% CI) | OR (95% CI) |
| Pocket park | 400 m | 1.683 (0.966–2.934) | 0.622 (0.311–1.240) | 0.576 (0.287–1.160) |
| | 800 m [a] | 0.912 (0.505–1.645) | 0.614 (0.285–1.320) | 0.690 (0.250–1.18) |
| | 1000 m | 1.453 (0.784–2.692) | 0.739 (0.335–1.630) | 0.482 (0.228–1.020) |
| 15-minute park | 400 m | 0.669 (0.356–1.258) | 1.675 (0.760–3.690) | 1.797 (0.808–3.990) |

**Table 5.** *Cont.*

| Park Type | Distance | Park Visitation | Physical Activity | Well-Being |
|---|---|---|---|---|
| | | OR (95% CI) | OR (95% CI) | OR (95% CI) |
| | 800 m [a] | 1.288 (0.675–2.459) | 1.803 (0.780–4.170) | 1.468 (0.621–3.470) |
| | 1000 m | 0.807 (0.427–1.525) | 1.171 (0.521–2.630) | 1.532 (0.712–3.290) |
| Neighborhood parks | 400 m | 1.127 (0.707–1.797) | 1.611 (0.901–2.880) | 1.629 (0.908–2.920) |
| | 800 m [a] | 1.280 (0.823–1.991) | 1.738 (0.996–3.030) | 1.708 (0.975–2.990) |
| | 1000 m | 1.208 (0.794–1.840) | 1.372 (0.806–2.340) | 1.206 (0.718–2.020) |
| Community parks | 400 m | 1.953 (1.003–2.530) * | 2.561 (1.184–5.540) * | 2.343 (1.082–5.070) * |
| | 800 m [a] | 1.841 (1.191–2.847) * | 2.417 (1.213–4.820) * | 2.211 (1.108–4.410) * |
| | 1000 m | 1.507 (1.028–2.209) * | 1.748 (1.008–3.030) * | 1.730 (1.008–2.970) * |

Note: [a] = Primary analysis threshold. * = $p < 0.005$. All models adjusted for income, education, gender, marital status, BMI, children in household, smoking, alcohol use, having NCDs, and neighborhood walkability. For physical activity and well-being models, we included park visitation as the independent variable.

## 4. Discussion

This study investigated how proximity to various park types in Bangkok, a dense tropical megacity, influences park visitation, physical activity, and mental well-being. Our analysis yielded three key findings that reveal important nuances in proximity-based urban green space policies. First, proximity to community parks (parks that provide everyday exercise, recreation and social spaces for communities and several adjacent neighborhoods and usually have an area around 5–20 ha), but not 15-minute parks, was significantly associated with recent park visitation. Second, living near community parks was positively associated with meeting WHO-recommended physical activity levels and reporting good well-being, while proximity to smaller parks showed no significant associations. Third, neighborhood walkability emerged as a significant independent predictor of park visitation, physical activity and well-being, indicating that health outcomes depend not only on park size and facilities but also on the neighborhood context where parks are located. While community parks maintained their benefits across different walkability levels, the strong independent effect of walkability suggests that proximity-based policies must consider both park characteristics and the quality of surrounding pedestrian environments.

### *4.1. Park Visitation*

While proximity-based planning policies often assume that closer parks automatically lead to higher park usage, our findings reveal that living near a community park was the only proximity variable significantly associated with park visitation, aligning with studies showing that park size and amenities are critical determinants for sustained engagement [52,53]. This pattern held true even at the 400 m and 1000 m thresholds. In contrast, proximity to smaller parks, including the newly established 15-minute parks, did not significantly increase visitation rates, despite their explicit design goal of promoting accessibility and use. The lack of association between pocket parks and 15-minute park proximity and visitation reflects several limitation factors in what small park areas can offer within Bangkok's context. First, the small parks size of pocket and 15-minute parks inherently limits the facilities that can be installed [54]. It also means that any available space must be carefully allocated, often prioritizing passive recreational features like benches and walking paths over active play areas, limiting the range of activities that can be supported [55]. Second, the area of pocket and 15-minute parks limits their ability to host multiple activities simultaneously. This can lead to conflicts between different user groups, such as children wanting to play and adults seeking a quiet space to relax [56]. Third, and perhaps most critically for Bangkok's tropical context, small parks cannot accommodate the ecological infrastructure needed for climate mitigation, such as insufficient space for tree canopies that provide shade and regulate microclimate, discouraging use during peak daytime hours [3,31,39,57].

*4.2. Physical Activity and Well-Being*

Our findings also demonstrate that proximity alone is insufficient to achieve physical activity and well-being benefits. Only proximity to community parks showed significant associations with both sufficient physical activity and well-being, while proximity to 15-minute parks, neighborhood parks, and pocket parks showed no significant associations with either outcome. The association between community park proximity and physical activity reflects the capacity of larger parks to accommodate activities that contribute meaningfully to meeting WHO guidelines of $\geq$150 min per week of moderate-to-vigorous physical activity [58]. Community parks typically feature amenities such as jogging tracks, sports courts, fitness equipment, and open areas suitable for group activities that enable diverse exercise options [59]. The larger size also allows for the integration of climate-adaptive features such as covered pavilions, sophisticated shade systems, and water features that enable comfortable physical activity during hot and humid weather conditions [60]. The significant association between community park proximity and well-being similarly reflects the capacity of larger parks to provide genuine restorative experiences. Mental health benefits from nature exposure require opportunities for psychological restoration, which depend on immersive natural environments, tranquility, and perceived escape from urban stressors [61,62]. Community parks offer sufficient space with greater separation from traffic, noise pollution, and visual complexity than typically found in a dense urban environment [63,64]. These findings imply a critical threshold effect in park proximity policies: below a certain size and amenity threshold, park proximity does not translate into measurable health benefits.

*4.3. The Role of Walkability*

The strong independent associations between walkability and health outcomes (OR > 5.0) warrant careful interpretation in Bangkok's context. The walkability findings must be interpreted within Thai urban culture, where walking often signifies low socioeconomic status while private vehicle ownership confers prestige. While the NEWS-A identified neighborhoods with better pedestrian infrastructure, in tropical cities this may indicate areas where destinations are close enough to make walking tolerable despite environmental discomfort, rather than genuinely pleasant walking environments [65,66]. Previous studies in Bangkok also found that residents in walkable areas can achieve physical activity through utilitarian walking and access diverse destinations for social interaction, potentially explaining why small parks show no additional benefits in these contexts [36,39]. The lack of synergy between walkability and park proximity suggests these environmental features serve distinct rather than complementary functions. Since the NEWS-A also measured the walkability to other destinations such as shopping malls and markets, it may also mean that walkable neighborhoods may provide access to air-conditioned destinations that partially substitute for outdoor recreation conducted in public parks [67,68]. This interpretation is supported by community parks' consistent benefits across both high- and low-walkability areas, indicating they fulfill essential needs regardless of neighborhood pedestrian infrastructure. Future research should develop Bangkok-specific walkability measures that account for tropical climate challenges, cultural attitudes toward walking, and the role of alternative transport modes. Understanding how walkability functions differently in tropical Asian cities versus temperate Western contexts is crucial for adapting international planning principles appropriately.

### 4.4. Neighbourhood Parks: A Problematic Middle Ground

Neighborhood parks showed no significant associations with physical activity and well-being outcomes despite being substantially larger than pocket or 15-minute parks, suggesting they represent a problematic middle ground in park functionality. This finding may partly reflect our sampling method. Most neighborhood parks were concentrated in the central part of Bangkok, but we sampled equally across all 50 districts. Hence, we might underrepresent people who live near neighborhood parks. However, methodological factors alone cannot explain the null effects, as community parks showed strong associations despite similar distributional challenges. Two substantive factors likely explain neighborhood parks' limited effectiveness. First, their intermediate size appears insufficient for the climate-adaptive infrastructure needed in tropical conditions. While featuring basic amenities such as playgrounds and walking paths, they cannot accommodate the extensive covered areas, diverse exercise facilities, or programming spaces that make community parks attractive despite the heat [69,70]. Second, neighborhood parks may suffer from a "proximity paradox" where their intermediate catchment area creates neither the convenience of hyperlocal access nor the destination appeal of larger parks. Unlike pocket parks that serve immediate neighbors within walking distance, neighborhood parks require intentional trips without offering sufficient amenities to justify the journey. This intermediate positioning may result in neighborhood parks being bypassed, where residents either utilize nearby pocket parks for quick visits or travel further to community parks for more rewarding experiences [71–73]. This finding has important implications for cities considering park systems: the traditional assumption that a park hierarchy system with graduated sizes serves complementary functions may not hold in contexts where environmental factors create higher thresholds for functionality.

### 4.5. Policy Implications

Three policy implications emerged from this study. First, our findings suggest that proximity-based green space policies focused solely on reducing distance through small parks may not improve park use. Instead, strategic placement of larger parks with better accessibility that can provide meaningful recreational opportunities may be more effective, even if they require longer travel distances for some residents. Second, our findings also reveal a critical threshold effect in park proximity policies: below a certain size and facilities threshold, park proximity does not translate into measurable health benefits. This suggests that Bangkok's substantial investment in small park proliferation may not be generating the expected health and well-being returns and that resources might be better allocated toward securing fewer but larger parks that can demonstrably improve population health outcomes. Third, our findings also indicate that successful proximity-based policies require coordination between park development and pedestrian infrastructure, but the fundamental challenge remains securing parks of adequate size and quality to generate meaningful health benefits when people do visit them.

A more effective proximity-based approach would prioritize securing parks of adequate size to generate health benefits, even if this means accepting greater distances between parks and some residents. Strategic placement of community-scale parks (5–20 ha) that can accommodate diverse activities, climate-adaptive infrastructure, and genuine recreational programming may achieve greater population health benefits than proliferating small parks throughout the city [74,75]. This shift would require several policy modifications. First, revising park planning standards to emphasize minimum size and amenity thresholds rather than maximum distance targets. Second, developing land banking strategies and public–private partnerships to secure larger parcels for park development, recognizing that community-scale parks require substantially more land than current small park initiatives. Third, concentrating park investments in strategic locations that can serve larger catchment areas while ensuring adequate transportation connections. Fourth, enhancing existing small parks where feasible by connecting them into larger park networks or upgrading them with more substantial infrastructure, though recognizing that fundamental size constraints may limit their potential effectiveness. Fifth, ensuring that new community parks include comprehensive climate-adaptive design features that enable year-round use in Bangkok's challenging environment. The goal should be creating a park system where proximity to any park means proximity to a space capable of supporting sustained recreational use and generating measurable health benefits, rather than simply ensuring that residents live near some form of green space regardless of its functionality [76].

### *4.6. Limitations and Future Research Directions*

This study provides important evidence about the limitations of proximity-based green space planning approaches discourse. These results highlight the need for more nuanced proximity policies that consider threshold effects and functional requirements rather than distance metrics alone. Cities adopting proximity-based green space policies should carefully evaluate whether their planned parks possess adequate size and amenities to generate intended health benefits, rather than simply counting the number of parks within walking distance of residents. The study also demonstrates the importance of context-specific evaluation of planning policies. Proximity effects that hold true in temperate climates with different urban densities and cultural contexts may not apply universally. Cities should invest in empirical evaluation of their green space policies rather than assuming that international best practices will transfer directly to local contexts.

However, this study has several limitations that should be considered. This study's cross-sectional design limits causal inference about the relationships between park proximity, walkability, and health outcomes, and unmeasured factors such as park quality, safety perceptions, or social characteristics may have influenced the observed associations. Longitudinal studies could better establish whether improvements in park access or walkability led to sustained changes in physical activity and well-being, while also capturing the temporal dynamics of how neighborhood changes influence health behaviors.

This study did not assess specific park quality characteristics such as facility diversity, maintenance levels, safety features, or the presence of amenities like exercise equipment, shaded areas, or walking paths. Recent evidence suggests that park quality attributes—including facility conditions, perceived safety, and maintenance standards—can be equally or more important than proximity in determining park use and physical activity outcomes [8,9]. While we incorporated neighborhood environmental attributes through the NEWS-A scale, which captures walkability features of the surrounding area, this measure does not reflect the internal quality of parks themselves. The absence of park quality data may have obscured important relationships; for instance, a nearby park in poor condition or lacking appropriate facilities might not attract visitors despite its proximity, while a well-maintained park with diverse amenities might draw users from greater distances. This limitation is particularly relevant for comparing different park types, as quality variations within each category (e.g., some pocket parks might be well-equipped while others offer minimal amenities) could not be accounted for in our analysis.

Our choice to dichotomize distance at policy-relevant thresholds (800 m for primary analysis, with sensitivity analyses at 400 m and 1000 m) allowed us to test whether specific distance thresholds matter for health outcomes, which directly informs proximity-based green space planning policies. However, we acknowledge that alternative analytical approaches could provide additional insights into the functional form of proximity–health outcome relationships. Future research could employ continuous distance measures with explicit nonlinear modeling techniques such as restricted cubic splines, generalized additive models (GAMs), or piecewise regression to identify more precise distance-decay patterns and potential inflection points. Such approaches might reveal, for example, whether health benefits decline gradually with distance or drop sharply beyond certain thresholds, and whether these patterns vary by park type or population subgroup. Additionally, machine learning methods could help identify complex interactions between proximity, park characteristics, and individual factors that influence park use and health outcomes.

Data collection for this study occurred during a single season (July–August 2024), which may not capture seasonal variation in park visitation patterns that could be particularly important in tropical climates with distinct wet and dry seasons affecting outdoor activity preferences. Future research should incorporate year-round data collection to understand how seasonal climate variation influences the effectiveness of different park types and walkability features. Furthermore, our binary measure of park visitation (yes/no in the past week) did not differentiate between visits at different times of day. Recent evidence suggests that nighttime park use in tropical regions can provide distinct psychological restoration benefits [32,33,76]. This limitation may have obscured important temporal patterns in how different park types are used throughout the day, particularly given Bangkok's extreme daytime heat [77]. Future studies should consider incorporating visit timing as a variable in analytical models to better understand how temporal patterns of park use relate to health outcomes.

Cost-effectiveness analyses comparing different combinations of park size and walkability improvements would provide valuable guidance for resource allocation decisions, particularly important for cities with limited budgets for urban improvements. Such analyses could help identify the optimal balance between park development and walkability improvements for maximizing population health outcomes within realistic financial constraints.

## 5. Conclusions

This study examined the relationship between proximity to different types of urban parks and health outcomes in Bangkok, providing critical evidence about the effectiveness of proximity-based green space policies in a dense, tropical megacity context. Our findings suggest important limitations in the fundamental assumption underlying many contemporary urban planning initiatives—that simply ensuring residents live near any type of park will automatically translate into improved public health outcomes.

The research revealed that proximity effects appear to be highly differentiated by park type, with only community parks showing significant associations with park visitation, physical activity, and mental well-being. In contrast, proximity to smaller parks, including the newly established 15-minute parks, neighborhood parks, and pocket parks, demonstrated no significant associations with these health outcomes in our study. This differential pattern indicates a potential threshold effect: parks may need to possess adequate size and amenities to generate measurable health benefits, regardless of how close they are to residents' homes. The lack of effectiveness observed for Bangkok's 15-minute parks raises questions with potentially important implications for urban planning strategies across Asian cities. Despite substantial public investment in creating small parks within walking distance of all residents, our findings suggest these facilities may be insufficient to overcome the multiple barriers to outdoor activity in Bangkok's challenging urban environment. The extreme heat, humidity, air pollution, and limited pedestrian infrastructure may create challenging conditions where small parks appear to have limited capacity to provide the diverse programming, climate-adaptive features, and immersive experiences that could potentially motivate regular use and generate health benefits in this specific context. Our findings also highlight the importance of neighborhood walkability as a potentially enabling condition for realizing park benefits. While high walkability was associated with increased park visitation and improved health outcomes, it appeared unable to compensate for the observed limitations of small parks. This suggests that successful green space strategies may require not only proximity and walkability but also parks of sufficient scale to support meaningful recreational activities and psychological restoration.

For Bangkok and similar cities facing land constraints, these results suggest that current proximity-focused policies may benefit from reconsideration. Rather than proliferating small parks that in our study showed limited associations with health benefits, cities might consider alternative strategies: securing fewer but larger community-scale parks through creative land acquisition mechanisms, connecting existing small parks into functional green networks, investing in comprehensive climate-adaptive design for all parks, and coordinating park development with pedestrian infrastructure improvements. The goal could shift from ensuring proximity to any green space toward ensuring proximity to functional green spaces that appear more likely to support sustained use and generate measurable health improvements. Cities should consider moving beyond simple distance metrics to explore the complex interactions between park size, quality, urban form, and climate that may influence whether proximity translates into public health benefits.

Our findings provide preliminary evidence for potential implications for sustainable urban development in tropical cities. Economically, investing in numerous small parks that show limited associations with health benefits may represent less efficient resource allocation, while strategic investment in fewer, larger community parks could potentially provide better returns through improved population health outcomes. Environmentally, larger parks may have greater capacity to deliver ecosystem services such as urban heat island mitigation and air quality improvement, functions that small parks appear to have limited capacity to provide in tropical climates. This research potentially contributes to multiple UN Sustainable Development Goals: SDG 3 (Good Health and Well-being) by suggesting the importance of functional park quality for health outcomes; SDG 11 (Sustainable Cities) by indicating that sustainable urban green space may require adequate size and amenities beyond simple coverage targets; and SDG 13 (Climate Action) by proposing how larger parks with climate-adaptive design could potentially support urban resilience while providing health co-benefits. By identifying possible size thresholds for park functionality in tropical contexts, this research offers preliminary evidence to help cities balance health outcomes and resource use in green space planning.

However, these findings should be interpreted within the specific context of Bangkok's unique environmental and cultural conditions. While our cross-sectional study provides important insights, longitudinal research incorporating park quality measures, seasonal variations, and diverse population groups would help validate these preliminary findings and better understand the causal mechanisms underlying the observed associations. Further research in other tropical megacities is needed to determine whether similar patterns exist across different contexts.

In conclusion, while ensuring equitable access to green space remains a worthy urban planning goal, our study suggests that proximity alone may be insufficient in certain contexts. Effective green space policies appear to require balancing proximity with functionality, ensuring that the parks within walking distance of residents have the potential to deliver the health benefits that justify public investment. For Bangkok and similar cities, this might mean considering trade-offs between the number of residents living near parks and the quality of parks they can access, which represents a difficult but potentially necessary recalibration of current planning paradigms. These findings contribute to an evolving understanding of how park proximity operates in diverse urban contexts, though continued research is essential to develop evidence-based, locally appropriate green space strategies.

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