WHAT’S KNOWN ON THIS SUBJECT: Quality urban playgrounds that are accessible and safe support physical activity and decrease injury rates. Little is known about the quality and accessibility of playgrounds in Chicago public parks.

WHAT THIS STUDY ADDS: Most playgrounds in Chicago are in fair condition, yet access to quality playgrounds varies by neighborhood. Public/private collaboration can lead to improved playgrounds, and failing playgrounds can be improved with modest investment.

abstract

OBJECTIVES: To assess playground safety and quality in Chicago, Illinois, identify disparities in access, and use the data to inform collaborative improvement.

METHODS: A cross-sectional survey of public park playgrounds in Chicago, Illinois, was conducted in 2009, 2010, and 2011 by using the National Program for Playground Safety Standardized Survey. All playgrounds were surveyed in 2009 and 2010; those that failed in 2010 were resurveyed in 2011. Playgrounds were assessed in 4 main categories: age-appropriate design, fall surfacing, equipment maintenance, and physical environment. Safety scores were generated from the assessment. Geographic information system mapping provided a visual description of the playground pass/fail rate based on neighborhood, child population, race/ethnicity, and poverty level.

RESULTS: Of the ~500 playgrounds, 467 were assessed in 2009, and 459 were assessed in 2010. In 2009, half of all playgrounds (55%) and in 2010, nearly two-thirds (61%) earned scores consistent with safe playgrounds ($P < .001$). Playgrounds scored poorest in fall surfacing and equipment maintenance. Geographic information system mapping showed neighborhoods with a higher percentage of children and impoverished families had fewer playgrounds and more failing playgrounds. In 2011, 154 (85%) of the playgrounds that failed in 2010 were surveyed. The mean playground score among failing playgrounds improved significantly between 2010 (61%) and 2011 (67%, $P < .001$).

CONCLUSIONS: Since the playground improvement initiative began in 2009, considerable progress has been made in the safety scores, although access to high-quality playgrounds varies by neighborhood. Many failing playgrounds can be brought up to standard with improvement in fall surfacing and equipment maintenance. Pediatrics 2013;131:233–241
Play is central to the healthy growth and development of children. Physical play, in particular, is associated with a decreased risk of obesity, improved self-esteem, and improved academic performance. Playgrounds can play an important role in supporting physical activity and maintaining a healthy BMI in children, especially in dense urban environments like Chicago. The quality and accessibility of play-grounds influence both their safety and use. Children are more likely to play on recently renovated playgrounds and playgrounds located near their homes. Poorly maintained playgrounds are less likely to engage children and have been shown to contribute to higher injury rates. Injuries sustained on playgrounds are common, leading to >200,000 emergency department visits annually. Many of these injuries are severe, including fractures, dislocations, and concussions. Improvement in playground quality may be an effective strategy to prevent these injuries.

Concern about playground quality and safety in Chicago, Illinois motivated local park advisory council members to request inspections from A.L.H., a certified playground inspector, to document safety hazards that could then be used by the Chicago Park District to make repairs or to build a replacement playground. This initiative led to the Chicago Playground Project, a collaborative effort of the Injury Prevention and Research Center at Ann and Robert H. Lurie Children’s Hospital of Chicago, the Chicago Park District, and Friends of the Parks, a nonprofit park advocacy organization. The objectives of the project are to improve the safety of Chicago Park District playgrounds by (1) building partnerships to promote safe play environments, (2) creating a surveillance system to monitor the safety of all park district playgrounds, (3) identifying playgrounds in greatest need of improvement and areas of neighborhood disparity, and (4) developing system-wide policies to improve playground safety through maintenance and new development. In this article, we present the results of our most recent playground surveillance. The aims of this analysis were to assess playground safety scores over multiple years and to identify any areas of disparity in playground access and quality. We hypothesize that by identifying the areas most in need of improvement, and sharing this information with stakeholders, playground scores will improve between study years.

METHODS
Setting
Chicago has ~500 public parks throughout the city. In this analysis, we define playgrounds as equipment or structures intended for children’s play. The Chicago Park District is responsible for the maintenance of these facilities. Many of the playgrounds were constructed from 1988 to 1993 when all of the asphalt playgrounds were converted into enclosed loose-fill, soft-surface areas. Between 2004 and 2012, 45 new playgrounds were constructed.

Survey Items and Assessment
The survey was adopted from the National Program for Playground Safety Institute of the National Recreation and Park Association. Each survey was verified by the certified playground safety inspector. In 2010 and 2011, surveyors collected data using Android telephones, allowing them to immediately forward pictures of severely hazardous equipment to the Chicago Park District for repair. To assess age-appropriate design, surveyors visually inspected playgrounds for separate play areas for ages 2 to 5 years and 5 to 12 years based on the design and scale of the equipment. They also assessed that platforms had appropriate guardrails and allowed for changes of direction when entering and exiting the structure. To assess fall surfaces, surveyors assessed if appropriate surfacing, defined as a unitary surface made from rubber or other energy-absorbing materials or loose-fill wood chips of an appropriate depth was present, if the height of the equipment was less than 8 feet, if suitable surfacing was present within 6 feet of any piece of playground equipment, if concrete bases to the playground structure were covered by surfacing, and if the surface was free of foreign objects, such as litter and glass. They also determined the depth of loose-fill surfacing by digging a hole to the dirt, concrete, or matting and measuring from the top to the bottom point of loose fill. Surveyors measured loose-fill surfacing under horizontal ladders (monkey bars), belt
TABLE 1  Playground Safety Score Items and Percentage of Playgrounds Meeting Safety Standard

<table>
<thead>
<tr>
<th>Safety Item Assessed</th>
<th>Playgrounds Meeting Safety Standard, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2009</td>
</tr>
<tr>
<td>Age-appropriate design</td>
<td></td>
</tr>
<tr>
<td>Separate areas for ages 2–5 and 5–12</td>
<td>25</td>
</tr>
<tr>
<td>Appropriate guardrails on platforms</td>
<td>94</td>
</tr>
<tr>
<td>Platforms allow change of directions</td>
<td>97</td>
</tr>
<tr>
<td>Fall surfacing</td>
<td></td>
</tr>
<tr>
<td>Suitable surfacing materials are provided</td>
<td>74</td>
</tr>
<tr>
<td>Height of equipment is &lt;8 feet</td>
<td>95</td>
</tr>
<tr>
<td>Appropriate depth of loose fill provided</td>
<td>17</td>
</tr>
<tr>
<td>Six-foot use zone has appropriate surfacing</td>
<td>97</td>
</tr>
<tr>
<td>Concrete footings are covered by surfacing</td>
<td>98</td>
</tr>
<tr>
<td>Surface is free of foreign objects</td>
<td>67</td>
</tr>
<tr>
<td>Equipment maintenance</td>
<td></td>
</tr>
<tr>
<td>Free of head entrapments</td>
<td>56</td>
</tr>
<tr>
<td>Free of broken parts</td>
<td>67</td>
</tr>
<tr>
<td>Free of missing parts</td>
<td>75</td>
</tr>
<tr>
<td>Well-anchored and stable</td>
<td>73</td>
</tr>
<tr>
<td>Free of protruding bolts and nails</td>
<td>88</td>
</tr>
<tr>
<td>Free of rust and peeling paint</td>
<td>29</td>
</tr>
<tr>
<td>Free of splinters</td>
<td>59</td>
</tr>
<tr>
<td>Free of cracks/holes in plastic equipment</td>
<td>84</td>
</tr>
<tr>
<td>S-hooks are properly closed</td>
<td>28</td>
</tr>
<tr>
<td>Physical environment</td>
<td></td>
</tr>
<tr>
<td>Tree limbs are trimmed</td>
<td>97</td>
</tr>
<tr>
<td>No tripping hazards</td>
<td>92</td>
</tr>
<tr>
<td>Playground is properly fenced</td>
<td>98</td>
</tr>
</tbody>
</table>

* Denotes items worth 2 points because of potential for significant increase in life-threatening injury.

Approximately 20% of playgrounds have rubber surfacing and are not reflected in this number.

Geographic Information System Mapping

Geographic information system (GIS) mapping was completed to provide a visual description of the playground pass/fail rate. By using the American Community Survey population estimates from 2005 to 2009, maps were created to assess the number of passing and failing playgrounds based on (1) community area, (2) percent child population, (3) race and ethnicity, and (4) poverty level. Chicago is divided into 77 well-defined and static community areas that are tied to census data and serve as the basis for urban planning initiatives.

Data Analysis

We calculated safety scores as a percentage of the items that were in accordance with rating standards. Based on the National Program for Playground Safety scoring system, scores ≥70% indicate a safe playground that requires only small improvements. Scores ≤69% indicate a failing playground that is potentially hazardous and may require multiple improvements. Statistical analyses were completed by using SPSS, version 12 (IBM SPSS Statistics, IBM Corporation, Armonk, NY). Descriptive analysis of the playground safety scores was performed. For playground survey years 2009 and 2010, categorical variables (pass/fail) were compared using \( \chi^2 \) tests. Paired \( t \) tests were used to compare 2009 and 2010 mean playground safety scores. In 2011, data collection was limited to playgrounds that failed the safety survey in 2010; these 2 years were also compared by paired \( t \) test. GIS mapping, using US Census 2000 data and GeoLytics 2007 demographic estimates (www.geolytics.com), provided a visual depiction of the distribution of safe playgrounds in relation to race, ethnicity, and income.

RESULTS

Survey of Playgrounds in 2009 and 2010

In 2009 and 2010, surveyors collected data on 467 and 459 of the ~500 playgrounds in Chicago; 418 of the playgrounds were assessed both years. Surveyors did not assess playgrounds undergoing construction, ~20 playgrounds each year, and missed a small percentage of playgrounds each year. In 2009, 54% of playgrounds (256/467) earned passing scores, increasing to 61% (278/459) in 2010 (\( \chi^2, P < .001 \)). In 2009, the mean score was 72%; median, 71% (range: 29% to 100%). In 2010, the mean score was 73%; median, 72% (range: 45% to 100%) (paired \( t \) test, \( P = .76 \)). Of the safety domains that were evaluated (Table 1), most playgrounds met safety standards in the age-appropriate design and physical environment categories each year. In both

Swings, and slides and recorded an average of the loose-fill depth. To assess appropriate equipment maintenance, surveyors inspected for broken and missing parts, protruding bolts and nails, rust, peeling paint, splinters, cracks, and holes in the equipment. They manually shook the equipment to ensure that it was well anchored. They inspected the equipment for properly closed S-hooks and head entrapments. A head entrapment is defined as any condition that impedes withdrawal of a body or body part that has penetrated an opening and is measured with industry-standard probes. Openings present an entrapment hazard if the distance between any interior opposing surfaces is >3.5 inches and <9 inches. The surrounding physical environment was assessed for well-trimmed tree limbs located away from equipment, tripping hazards, and proper fencing surrounding the playground from street traffic.
years, playgrounds scored poorest in fall surfacing and equipment maintenance. Nearly 25% of playgrounds in both 2009 and 2010 did not provide suitable surfacing. Suitable playground surfaces include a unitary surface made from rubber or other energy-absorbing materials or loose-fill wood chips of an appropriate depth. The Handbook for Public Playground Safety, issued by the Consumer Product Safety Commission, recommends a minimum wood chip depth of 9 inches; however, a wood chip depth of 12 inches is ideal.22 The average wood chip depth was 5.9 inches in 2009 and 4.0 inches in 2010. Of playgrounds with wood chips, 83% in 2009 and 99% in 2010 had inadequate surfacing depth. Playgrounds with rubber surfacing were less likely to fail in both years than playgrounds with wood chips ($P < .001$). Approximately, 20% of playgrounds each year had rubber surfacing.

Playgrounds scored poorly in several areas of equipment maintenance. Of the items with potential to cause life-threatening injury, nearly equal percentage of playgrounds in 2009 and 2010 had head entrapments, broken parts, and missing parts. The number of playgrounds with equipment that was poorly anchored and unstable increased from 27% in 2009 to 42% in 2010.

**Survey of Playgrounds in 2011**

Of the 181 playgrounds that earned failing scores ($\leq 69\%$) in 2010, 154 (85%) were reassessed in 2011. Upon reassessment, 40% (62/154) earned passing scores. Mean scores of that

![Map depicting passing and failing playgrounds in relation to percentage of children 14 years old and younger.](image-url)
sample increased from 61% in 2010 to 67% in 2011 (paired t-test, \( P < .001 \)).

**GIS Mapping**

GIS mapping revealed that passing playgrounds and failing playgrounds were distributed across the city of Chicago; however, noticeable and important neighborhood differences exist. Neighborhoods where more children live have more failing playgrounds and notably fewer playgrounds (Fig 1). Similarly, neighborhoods where a larger percentage of the population is below the poverty level have more failing playgrounds and fewer playgrounds (Fig 2). Neighborhoods with a higher percentage of African American children had more failing playgrounds (Fig 3), and areas with higher percentage of Hispanic children had fewer playgrounds (Fig 4).

**DISCUSSION**

Safe and accessible playgrounds play an important role in supporting healthy growth and development in children. In this study, we report on the safety of playgrounds in Chicago from 2009 to 2011. Our results show that most playgrounds are in fair condition although there is a disparity in geographical distribution of both playgrounds and safe playgrounds. Playgrounds systematically met safety standards for the age-appropriate design and physical environment criteria. They were more likely to fail because of problems with fall surfacing and equipment maintenance. One-quarter of playgrounds did not provide adequate surfacing, and most playgrounds with wood chip surfacing did not provide an adequate depth of
wood chips. The lack of adequate surfacing is particularly important, as falls to the surface account for up to 75% of injuries on playgrounds. Use of safe surfacing can reduce the severity and prevalence of these injuries. Additionally, playgrounds did not meet several equipment maintenance safety standards.

We are using the information from our playground surveillance study to improve playground safety by providing local, timely, accurate, accessible, and easily understood data for our collaboration with the Chicago Park District and Friends of the Parks. Thus far, our efforts have been focused on improved maintenance and increased community awareness. For example, when our surveyors note a playground hazard that has risk to cause substantial harm, a photo of the hazard and its location is sent to the park district so a maintenance crew can be dispatched to repair or remove the hazard. In addition to providing prompt notification for timely repair of significant hazards during our surveys, we have supported the Chicago Park District by providing continuing education funds for select employees to be trained as certified outdoor play inspectors. We will also be providing general playground safety training to all maintenance staff. Additionally, on the Friends of the Parks Web site, we post the safety score of each playground to inform the community of their local playground’s status. Community members have used this information to advocate for playground improvements or replacement.

During our 3-year study period, considerable progress has been made in the safety scores. More playgrounds received passing scores between 2009 and 2010. This trend continued with 40% of the playgrounds sampled from failing 2010 playgrounds moving into the

**FIGURE 3**
Map depicting passing and failing playgrounds in relation to percentage of the black population.
passing range in 2011. Continuing to make simple, cost-effective interventions, such as systematically replacing wood chips, repairing broken equipment, and removing unsafe equipment, could significantly improve the scores and safety of the playgrounds going forward.

GIS mapping visually revealed disparities between neighborhoods. Neighborhoods with a higher percentage of children, especially minority children, and a higher percentage of the population living in poverty had both fewer playgrounds and more failing playgrounds. Previous studies have shown similar results. A study in Boston found that neighborhoods with a greater proportion of youth living in poverty had less access to playgrounds, especially safe playgrounds. Similarly, a national study found that areas with lower median incomes had less access to a wide variety of public and private facilities for physical activity, including categories of facilities that were expected to be distributed equally (e.g., playgrounds, YMCAs, and schools). A smaller study evaluating the safety of Chicago playgrounds in low-income and very low-income neighborhoods found the playgrounds to be of overall good design but needing improvement in wood chip depth and equipment repairs. Lack of access to safe playgrounds may be particularly important for children living in neighborhoods with few playgrounds because they may be more dependent on public playgrounds for outdoor play.

Our study has several limitations. Although it would seem to be a simple task, it is a challenge to count the precise number of playgrounds in the Chicago Park District because many parks have multiple playground structures, some separated by a few yards, others by a few blocks. Nevertheless, each year that we did a full assessment we believe we have surveyed at least
90% to 95% of eligible playgrounds. Additionally, our study only evaluated playgrounds located in public parks and did not evaluate other frequently used playgrounds, such as those located at schools or day care sites. Moreover, our study is limited to a single large Midwestern city, which may limit the generalizability of the project as well as the results.

Although we used a standard survey tool to assess the playgrounds, it has not been validated. Only one study to date has attempted validation and revealed high reliability (Cronbach’s α = 0.963, intraclass correlation coefficient = 0.926) between 2 different measures conducted by the same trained surveyor. Determining the depth of wood chips, in particular, is inherently difficult and influenced by when the measurement is taken in relation to routine replenishment of the chips. It is possible that our measurements varied between study years because of the timing of our assessment relative to wood chip replacement. The survey tool defines ≥70% as passing, but we do not know how well this score discriminates the risk of injury. In other words, a playground with a score of 68% may in practice not be different from a playground with a score of 72%. The usefulness of the survey tool may not be in its absolute score but that it consistently measures change over time. By identifying playgrounds most in need of improvement and criteria that lead to poor playground safety scores, informed choices can be made in developing systemwide policies for playground maintenance.

CONCLUSIONS

In summary, playground safety scores varied across the city of Chicago. Playgrounds were more likely to fail because of problems with fall surfacing and equipment maintenance. Additionally, neighborhoods with more children, especially minority children, and impoverished families had fewer playgrounds and more failing playgrounds. However, steady improvements were made during our study period. By strengthening our community partnerships, we hope to develop safe neighborhood playgrounds that are equitably distributed to benefit the health of children and their communities.

ACKNOWLEDGMENTS

We gratefully acknowledge the Chicago Park District for their involvement in this project and Albert Benedict and the Center for Neighborhood Technology for completing the GIS mapping.

REFERENCES

BLUE: The other day, I went online to update my professional medical information. After creating an account and a unique 10-character password, I was then prompted to select three questions to which, presumably, only I would know the answer. The very first question was: “What is your favorite color?” Whoever designed that question clearly did not know much about human color preferences. As reported in The New York Times (Science: November 22, 2012), humans have a distinct fondness for the color blue. In most cultures, approximately 50% of people report their favorite color is blue. Although only one in six Americans have blue eyes, half the population thinks that blue eyes are the prettiest. Throughout human history, blue coloring has been highly valued and implied nobility, value, and social standing. Blue pigments were often more valuable than gold. While many psychologists believe that the color blue suggests calmness and openness, blue can convey depression as well. Pablo Picasso, depressed by the suicide of a friend, for years painted in shades of blue. People still refer to the blues.

Scientists are intrigued by the color primarily because of its intensity and rarity among land animals. Researchers recently described the structural analysis of a remarkably and intensely blue fruit from the African Pollia condensata plant. Other scientists reported the discovery in the Congo basin of a rare new species of monkey with a patch of vivid blue skin – a startling contrast to the browns, tans, and blacks found in most other mammalian species. To be honest, I too like blue. I thought about writing chartreuse as my favorite color at the login prompt, but realized I would probably forget, and had to stick with blue.

Noted by WVR, MD
Playground Safety and Quality in Chicago
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