Summary of Playground Surfacing Focus Groups

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Executive Summary

The report titled, "Summary of Playground Surfacing Focus Groups," presents the findings of research conducted by the Fors Marsh Group (FMG), under Contract CPSC-D-16-0002.

The public, media, and government agencies have expressed concern that the chemicals in surfaces derived from recycled tires may be hazardous to human health. In February 2016, the Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds was announced.[1] This is a multi-agency effort, which includes the U.S. Environmental Protection Agency (EPA), Centers for Disease Control and Prevention (CDC), and the U.S. Consumer Product Safety Commission (CPSC), performing research that seeks to improve the understanding of potential health effects of recreational exposures to recycled tires. The CPSC is studying exposures of children to playground surfaces derived from recycled tires. Ultimately, the CPSC intends to initiate a nationwide survey to acquire representative exposure data, and in turn, inform future research in the associated hazards.

To direct survey design and development, FMG, in collaboration with staff from the CPSC, led three focus groups and three in-depth interviews. Twenty-six participants were asked about a variety of topics, such as exposure scenarios, activity patterns, adult supervision, and safety concerns. Some areas of concern reported by participants in the study include, but are not limited to, the following:

- children who may frequently mouth and chew rubber surfacing materials,
- rubber surfacing that can leave stains on children's skin and clothing,
- children who may not be cleaned/sanitized until they return from the playground,
- guardians who are often distracted by electronics, work and other playground visitors, and
- how guardians may sometimes allow children out of their line of sight.

The findings from this study raise awareness of significant concerns that warrant further investigation. If the nationwide survey confirms that these issues are widespread, then future research and remediation could be warranted. The attached report details the background, methodology, and findings from the focus groups and interviews, as well as the next steps of the project.

[1] https://www.cpsc.gov/s3fs-public/federalresearchactionplantirecrumb.pdf.

1 Introduction

1.1 Background

Playground surfaces derived from recycled tires are a popular option, due to their low maintenance, variety of colors and designs, and ability to attenuate mechanical impacts from falls. The public, media, and government agencies have expressed concern that the chemicals in surfaces derived from recycled tires may be hazardous to human health. Limited studies have not shown an elevated health risk from playing on fields with recycled tire crumb, but the existing studies have not comprehensively evaluated the concerns about health risks from exposure to these materials.[2]

In February 2016, the Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds was announced. This is a multi-agency effort that includes the U.S. Environmental Protection Agency (EPA), Centers for Disease Control and Prevention (CDC), and the U.S. Consumer Product Safety Commission (CPSC) performing research that seeks to improve the understanding of potential health effects of recreational exposures to recycled tires. The EPA and CDC are studying the chemical characteristics of recycled tire materials and the exposures on athletic fields. The CPSC is assessing the risk to consumers associated with the use of recycled tire materials in playground surfaces.

The CPSC funded the Fors Marsh Group, LLC (FMG), an applied research firm in Arlington, VA, to conduct a nationwide survey to assess typical use patterns of recycled playground materials by toddlers. To aid in the development of this survey, FMG conducted focus groups and telephone interviews to gather data from a sample of parents, childcare providers, and Certified Playground Safety Inspectors (CPSIs). Parents and childcare providers discussed their experiences and observations of how children interact with various types of playground surfaces, including those derived from recycled tires; CPSIs discussed their professional experience maintaining playgrounds. This report summarizes the findings from the playground surfacing focus groups.

1.2 Objective

The overall objective of this project is to support efforts to assess children's exposures to recycled playground surfacing materials. By identifying typical use scenarios, staff gains insight into the possible regularity, duration, and modalities by which children are typically exposed to recycled playground surfacing materials. Knowledge of children's exposure patterns equips staff to improve on characterizing chemical safety hazard exposure scenarios. Ultimately, project results will be used to determine specific risk-mitigation strategies regarding playground surfaces derived from recycled tires.

[2] See https://www.epa.gov/chemical-research/federal-research-recycled-tire-crumb-used-playing-fields.

2 Methodology

2.1 Study Design

FMG conducted three focus groups. The first two sessions captured exposure information from parents and childcare providers, and the third session captured information from CPSIs. The focus groups took place in Arlington, VA, in March 2017. Sessions were approximately 90 minutes long. Due to low turnout at the CPSI focus group, three individual phone interviews were conducted with CPSIs to supplement findings for that population. Phone interview sessions lasted approximately 1 hour and took place in April 2017.

CPSC staff, with input from FMG, developed a series of topics for discussion, based on field observations of young children (up through age 5 years) at playgrounds in the Washington, D.C., metropolitan area during summer 2016 (See Appendix I for details). At the focus groups, all participants were asked about their experience with various playground surfacing materials and the advantages and disadvantages of the surfacing materials. Participants discussed two categories of surfacing materials: loose-fill surfacing materials, such as wood mulch and rubber mulch, and unitary (solid) surfacing materials, such as bonded rubber, poured-in-place rubber (*aka* Smooth, continuous rubber), and rubber tiles. Furthermore, parents and childcare providers discussed children's behavior and use patterns, as well as hygiene, clothing, and supervision practices. CPSIs discussed inspection and maintenance of playground surfacing materials, injury reporting, and general playground safety concerns. In addition to discussing non-rubber playground surfaces, participants were asked about other topics related to playground safety, such as signage and equipment use (see Appendix II). Findings regarding these other topics will also inform future playground safety endeavors. The research was approved by the U.S. Office of Management and Budget (OMB) and received an exemption from Chesapeake Institutional Review Board (IRB). Each focus group and interview was moderated by an RIVA-trained[3] representative from FMG. After the focus groups and interviews were conducted, a detailed coding manual was created to organize and interpret the transcripts. Multiple FMG coders then reviewed the transcripts to evaluate their consistency and to ensure an acceptable level of inter-coder reliability. Staff of the CPSC Engineering Sciences Division of Human Factors (ESHF) examined the focus group and interview recordings and the findings produced by FMG.

2.2 Participants

FMG reached out to parents and childcare providers via the FMG database of people who have expressed an interest in participating, or who have participated in past studies. For CPSIs, FMG used the publicly available CPSI registry from the National Recreation and Parks Association.[4] Participants for all three groups were also contacted via other methods,

[3] RIVA Training Institute for Market and Social Research. See: http://www.rivainc.com/training/.
[4] See https://apps.nrpa.org/CPSI_registry/default.aspx.

such as social media networks and advertisements. Potential participants completed a study screener to ensure that they qualified to participate based on study criteria.

Twenty six participants were recruited for the focus groups/interviews. Participants were separated into three groupings: Caregiver Group 1, Caregiver Group 2, and CPSIs.

1. Caregiver Group 1 had nine participants. Seven of the nine participants reported being parents. Of the two remaining participants, one stated that she was a babysitter and daycare worker, and the other stated that she was a teacher.
2. Caregiver Group 2 had ten participants, six of whom reported being daycare workers, and the remaining four stated they were babysitters and/or nannies.
3. The CPSI group had seven participants. These participants reported being park and recreational facility employees who inspect and maintain playgrounds on a regular basis (*i.e.,* once a month or more) with current CPSI certification.

Study participants were compensated $100 for their time. Participant demographic information by grouping can be found in Table 1 below.

Table 1: Participant Demographics

	Caregiver Group 1	Caregiver Group 2	CPSIs	Total (participants)
Age				
18-25	1	3	1	**5**
26-35	8	3	2	**13**
36-45	0	2	2	**4**
46-55	0	1	1	**2**
56-65	0	1	1	**2**
Total (Participants)	**9**	**10**	**7**	**26**
Gender				
Male	4	1	6	**11**
Female	5	9	1	**15**
Total (Participants)	9	10	7	26
Race/Ethnicity				
White	1	3	3	**7**
African American	6	3	4	**13**
Hispanic	2	0	0	**2**
Asian	0	1	0	**1**
Native Hawaiian or Pacific Islander	0	1	0	**1**
Not Specified	0	2	0	**2**
Total (Participants)	**9**	**10**	**7**	**26**
Household Income				
$10k - $24,999	1	2	0	**3**
$25k - $34,999	1	5	0	**6**
$35k – $49,999	1	1	2	**4**
$50k - $74,999	2	0	2	**4**
$75k – $99,999	1	0	1	**2**
$100k+	3	0	2	**5**
Not Specified	0	2	0	**2**
Total (Participants)	**9**	**10**	**7**	**26**

Participants' experience in playgrounds and number of children supervised, ages of children supervised, and additional information are summarized in Tables 2-7.

Table 2: Surfacing Materials Viewed by Participants Prior to Focus Groups

Surfacing	Caregiver Group 1	Caregiver Group 2	CPSIs	Total (participants)
Wood Fiber	8	8	7	**23**
Rubber Mulch	6	2	3	**11**
Unitary Fill	7	9	7	**23**

Table 3: Number of Children Supervised by Participants

Number of Children Supervised	Caregiver Group 1	Caregiver Group 2	Total (participants)
1	7	2	**9**
2	2	2	**4**
3	0	3	**3**
4	0	3	**3**
Total (Participants)	**9**	**10**	**19**

Table 4: Ages of Children Supervised by Participants

Ages of Children Supervised (years)	Caregiver Group 1	Caregiver Group 2	Total (children)
1	4	4	**8**
2	7	10	**17**
3	0	1	**1**
4	0	1	**1**
Total (Participants)	**9**	**10**	**--**

Table 5: Reported Playground Visits per Week

Visits per Week	Caregiver Group 1	Caregiver Group 2	CPSIs	Total (participants)
3	4	3	--	**7**
4	3	3	--	**6**
5	1	3	--	**4**
6	0	0	--	**0**
7 or more	1	1	--	**2**
Total (Participants)	**9**	**10**	**--**	**19**

Table 6: Reported Average Time spent at the Playground

Gender	Caregiver Group 1	Caregiver Group 2	CPSIs	Total (participants)
Up to 1 hour	4	1	6	**11**
More than 1 hour	5	9	1	**15**
Total (Participants)	**9**	**10**	**7**	**26**

Table 7: Years of Experience as a CPSI

	< 1 Year	1 to 4 Years	5 to 9 Years	10+ Years	Total (participants)
Number of Participants	2	3	1	1	**7**

3 Results

Detailed below are the findings from the three groups including parents, childcare providers, and CPSIs. The observations mentioned below are solely reports from the participants and do not reflect facts or opinions held by the CPSC. Findings not directly related to playground surfacing are included in Appendix II.

3.1 Caregiver Group 1

Participants in this group were asked general playground-use questions and to discuss the advantages and disadvantages of loose-fill surfacing and unitary surfacing. Additionally, they were asked to share information about typical child hygiene, clothing, and supervision practices at playgrounds. Participant observations and self-reports, as stated in the focus group, are exhibited below.

Playground-use information. Participants report visiting playgrounds throughout the year, especially during the spring and summer months. Some go to indoor playgrounds when they feel it is too hot, cold, or wet outside. Typical playground visits are 1 hour. The decision to visit a playground normally depends upon several factors, including: temperature, weather, caregiver's energy, child's energy, day of the week (smaller crowds are preferred), proximity to woods (avoiding woods because of substance abusers), activities available, reviews, and cleanliness.

They typically see children between 1 and 12 years of age at playgrounds. Children begin using equipment around age 1. Some participants report that children spend the majority of their playground time on the equipment, while others say children spend most of their time on the surface. Participants typically bring the following items to playgrounds: toys (such as trucks), water, snacks, and sanitizers. They bring fewer items as the children grow older.

Loose-fill surfacing. The participants report generally disliking loose-fill surfacing materials. They frequently see children mouthing and chewing mulch (both wood fiber and rubber). Children like to pick it up and throw it. It gets in their hair, shoes, socks, pockets, diapers, and in/on their clothes. Loose fill is normally uneven, increasing the frequency of tripping and making it more difficult to maneuver wheeled products, such as strollers and wheelchairs. The participants also fear that, because this type of surface moves around, it can conceal hazards, such as broken glass, on the playgrounds. They expressed concerns about wood mulch holding more moisture than unitary alternatives, staining knees and pants, and leading children to get splinters.

When compared to wood fiber mulch, most of the participants prefer rubber mulch. They claim it is softer, has a nicer color, and they appreciate that it involves recycling. However, it can be slippery when wet, and the participants are concerned about health implications from children mouthing and chewing it.

Unitary surfacing. The participants prefer unitary surfacing materials. Unitary surfacing tends to be more level than loose fill, and it accommodates various activities, such as running, playing with balls, tumbling, flipping, jumping rope, and games that involve sitting down. Children are less likely to get dirty and pick up unitary surfacing materials. Although the participants believe falls are less frequent on unitary surfaces, they are concerned about impacts being much harder and resulting in rug burns and scrapes. Relative to loose-fill surfacing, participants have found that water makes the ground slicker, increasing the likelihood of falling. They prefer poured-in-place surfacing to rubber tiles and bonded rubber; tiles can become uneven over time, increasing the likelihood of falls, and the participants do not like the way bonded rubber feels.

Hygiene and clothing. Some participants allow their children to eat snacks at playgrounds, while others never bring food to playgrounds. Some participants bring sanitizer, while others wait until they go home to wash up. All participants report washing their children's hands after returning from the playground, and most report bathing children immediately after returning home. The group unanimously agrees that pacifiers should not be taken to playgrounds because they frequently fall out and get dirty. Toys used at the playground are sometimes rinsed with water. Participants may disinfect playground toys if they are noticeably dirty. One participant reports sanitizing all playground equipment before use.

In general, they prefer that children wear close-toed shoes and long clothing to prevent scrapes at playgrounds; however, children often wear sandals, flip flops, shorts, and t-shirts, especially when it is warm outside. Frequently, shoes come off, especially on loose-fill playgrounds.

Supervision. The participants report maintaining close supervision of their young children, while they also report allowing some space to their older children, to explore independently and play with friends. They claim that other guardians, however, are often distracted by electronics, work, and other playground visitors. Supervision of children by other guardians is especially lacking when guardians bring older children and/or multiple children of mixed ages to the playground. The participants agree that sometimes other guardians allow children to get completely out of their line of sight, and in such cases, the

participants do not intervene with someone else's child, unless it is a serious safety risk, or if the actions are negatively affecting their own child.

3.2 Caregiver Group 2

Participants were asked general playground-use questions and to discuss the advantages and disadvantages of loose-fill surfacing and unitary surfacing. Additionally, they were asked to share information about typical child hygiene, clothing, and supervision practices at playgrounds. Participant observations and self-reports, as stated in the focus group, are exhibited below.

Playground-use information. The participants report visiting playgrounds year-round. When they feel it is too hot, cold, or wet outside, some participants state that they use indoor playgrounds. The group unanimously prefers outdoor playgrounds to indoor playgrounds. Typical visits are 45 minutes to 1 hour in length and occur around noon, with the latest visits ending around 7:30 p.m., or whenever streetlights come on. The youngest children they bring to playgrounds are about 1-year-old, but the children do not use playground equipment until around age 2. Children at playgrounds tend to range from ages 1 to 12. The participants say they normally bring the following supplies with them to the playground: bottled water, snacks, cars, bikes, balls, toys, buckets, diapers, wagons, hand sanitizer, first-aid kits, extra clothes, sunscreen, and insect repellent.

Loose-fill surfacing. The participants say loose-fill surfacing materials, especially with wood mulch, are the most common type of surfacing materials used at playgrounds. When asked to discuss loose fill, they voiced many disadvantages about the surfacing type. They claim it gets in and on shoes, clothes, diaper bags, stroller pockets, socks, and hair. Children frequently pick it up and mouth it, chew it, pocket it, and throw it at each other. Because of its propensity to become unevenly distributed, children fall down more frequently, and it is difficult to push wheeled products like strollers. Children have difficulty running, playing tag, and jumping rope on loose-fill playgrounds. Hazards, such as broken glass, can be hidden in the surfacing materials.

When wood fiber is used, children can get splinters and be poked by protruding sticks. Wood mulch also gets muddy when it is wet outside. Rubber mulch is preferred to wood mulch because it is softer, does not carry a risk of splinters, and it is not as messy. Participants claim that rubber mulch does get hot during the summer though, and it can leave black marks on shoes and clothing.

Unitary surfacing. The participants prefer unitary surfacing materials, composed of recycled rubber, to loose-fill and unitary non-rubber surfacing materials (such as concrete). They like poured-in-place materials the most, followed by rubber tiles and bonded rubber. Rubber tiles can become uneven and make tripping more common though, and bonded rubber can be abrasive against skin. When properly maintained, unitary rubber surfacing is stable and soft, so children are less likely to fall; and when they do fall, the surface offers better impact attenuation than unitary non-rubber surfacing materials.

The participants report that it is easier for children to play on unitary surfacing materials than on loose fill. Common playground activities on unitary surfaces include: hop scotch, running, playing tag, using jump ropes, and playing with balls. Children do not get as dirty

playing on unitary surfacing, and they are unable to pick up, eat, or throw the materials at each other. It is easier to see and avoid hazards on/within the surface. The surface appears to be higher quality, but it can leave marks on clothing, and it gets hot in the summertime. In general, they feel there is less to worry about with unitary rubber surfacing materials than the alternatives.

Hygiene and clothing. Routines vary from person to person and by playground. Some participants feed snacks, such as cookies, crackers, apples, and bananas to children while at playgrounds. Most say they do not feed children at the playground because children want to eat and play at the same time, and they often drop food on the playground and then pick it back up and put it into their mouth. Some of the participants report using sanitizing products at playgrounds, while others say they wait until the children are back at home to wash up, because the children will just get dirty again while playing. All participants report washing children's hands, sometimes their face and feet, after returning from playgrounds. For some, the clean-up process depends on whether they use an outdoor playground and if there is loose fill. After visiting playgrounds with loose fill, the participants normally have to pick the surfacing materials out of the children's clothes and shoes. Some always wash toys used at playgrounds, whereas others only wash toys if there is visible dirt. Most just rinse toys with water, although some use sanitizer.

The participants generally prefer children to wear long clothing and shoes because they frequently see children fall at playgrounds, and long clothing provides some protection from scrapes. Shoes often come off though, especially on loose-fill surfaces, and children occasionally go to playgrounds in shorts, t-shirts, and flip flops. The participants report commonly seeing some children, especially infants, barefoot at playgrounds, and indoor playgrounds often require shoes to be removed before entering the surface. Preferences aside, what children wear at the playgrounds often depends upon whatever the children are already wearing when the caregiver meets with them.

Supervision. The participants report keeping their eyes and ears on the children at all times. Some heavily supervise children from up close, whereas others give them some distance. They believe children tend to want more independence as they get older and feel embarrassed if the guardian is too intrusive. The participants feel more comfortable giving children distance as they get older. They believe children understand safety risks at older ages.

The participants claim that other guardians do not provide sufficient supervision. They often see other guardians socializing or talking on their cellphones instead of watching their children. Often, other guardians will bring multiple children of mixed ages and take their eyes off the older children. Participants state that they do not look out for others' children for whom they are not responsible.

3.3 Certified Playground Safety Inspectors (CPSIs)

CPSI participants were asked to discuss inspection and maintenance of playgrounds, including advantages and disadvantages of the different surfacing types. Participant observations and self-reports, as stated in the focus group and in interviews, are exhibited below.

Inspection and maintenance. The participants vary greatly in the number of playgrounds they maintain. They explained that usually one or two CPSIs are assigned to each region, and they work alone. They normally inspect playgrounds weekly for general safety and vandalism. CPSIs perform general equipment maintenance and look for broken glass, trash, trip hazards, standing water, and displaced loose-fill materials. Factors such as volume of traffic and use of loose fill may warrant more frequent maintenance. Playgrounds that are less frequented may only be serviced monthly. Additionally, each playground has an annual in-depth inspection and most have bi-weekly trash pick-ups. Volume of traffic at playgrounds tends to be highest in the summer and lowest in the winter. Accordingly, maintenance is more frequent during the summer months, and major repairs are likely to be delayed until the winter, when feasible. The participants had various concerns about different surfacing materials.

Loose-fill surfacing. The participants report preferring loose-fill surfacing materials to unitary surfacing. Loose fill is more difficult to vandalize and faster and less expensive to repair. Unlike unitary surfacing, a contractor is not needed because anyone can spread it. Loose fill requires more maintenance, however, because it gets displaced and may conceal hazards, such as broken glass. The participants prefer wood mulch to rubber because it is cheaper, easier to acquire, and less flammable. The participants are also concerned about children picking up rubber mulch, chewing the material, and choking on it. Wood mulch is supposed to be replaced at least once a year because of displacement, settling, collecting water, and developing mold, moss, and slippery surfaces.

Unitary surfacing. The participants report disliking unitary surfacing materials. Although it is usually easier for disabled users to navigate, lasts longer, and looks nicer, unitary surfacing is deemed by participants to be prohibitively expensive and more likely to be vandalized. They also believe rubber unitary surfacing is flammable, and they are concerned about the volatility of fumes released from burning rubber. In their experience, children tend to pick at unitary rubber surfaces, especially bonded rubber, causing it to become uneven within months.

Unitary surfaces are also affected by tree roots and contraction from freezing. Uneven surfacing then presents a trip hazard, and unitary surfacing tends to have weaker impact attenuation than loose fill. Uneven unitary surfacing also results in standing water, which collects filth and mold, and makes the ground slippery. Sections of rubber tiles and poured-in-place surfacing can be replaced, but usually only by a contractor. Poured-in-place surfacing tends to last about 10 years, but it can last substantially less, depending on use and weather.

4 Discussion

CPSC staff seeks to make data-driven policy recommendations for playground surfaces derived from recycled tire crumb. Findings from the focus groups and interviews provide a snapshot of exposure information from individuals of the populations of greatest interest. These data are being used to inform the development, design, and implementation of a nationwide survey. The survey, a joint effort by FMG and the CPSC, will afford staff a nationally representative sample, resulting in data that can provide a deeper and more

accurate understanding of typical exposure of children to recycled playground surfacing materials. In turn, the exposure information will be used in risk assessment, which will help determine specific risk-management strategies associated with recycled playground surfacing materials. The findings below are solely reports from the participants and do not reflect facts or opinions held by the CPSC.

4.1 Exposure Information

Reports from parents, childcare providers, and CPSIs were relatively consistent. According to participants, children:

- frequently pick up rubber mulch and pick at bonded rubber surfacing material;
- often mouth and chew rubber surfacing materials;
- occasionally wear shorts, t-shirts, sandals, and other clothing that affords limited coverage at playgrounds, and their shoes often come off (infants normally go to playgrounds shoeless and sometimes go barefoot);
- regularly fall on all playground surfaces, especially those with loose-fill surfaces and uneven unitary surfacing, sometimes resulting in abrasions;
- get stains on their skin and clothing from rubber surfacing;
- occasionally eat snacks at playgrounds;
- may not be cleaned/sanitized until they return from the playground;
- may not have their playground toys sanitized after visiting the playground (some guardians only clean the toys by rinsing them, and only if there is noticeable dirt); and
- are frequently observed to have little supervision because some guardians are often distracted by electronics, work, and socializing, and guardians rarely supervise children for whom they do not feel responsible.

4.2 Playground Surfacing and Maintenance

Participants shared the following observations and self-reports:

- Unitary rubber surfacing material is the preferred surfacing option by parents and childcare provider participants, and mulch is the least desired.
- The preferred surfacing option by CPSI participants is loose-fill surfacing material, especially wood fiber mulch; and the least desired surfacing material is unitary rubber.
- While parents and childcare providers report that older children tend to partake in riskier behavior than younger children, they both report that older children are less likely to be supervised. Caregiver Group 2 believes older children are more safety conscious.
- CPSIs report that playgrounds tend to be inspected weekly, although some are inspected monthly.
- CPSIs perform regular maintenance more frequently in the warmer months during peak usage.

- CPSIs explained that playground equipment is more likely to be replaced than repaired and major replacements normally occur in the winter, when fewer children are at the outdoor playgrounds.

4.3 Additional Playground Safety Information

Additional playground safety information was acquired during this study that may support future research, revisions to voluntary standards, and updates to the CPSC *Public Playground Safety Handbook*. According to participants:

- the age-recommendation labels are a good idea; however, they believe many guardians ignore the labels;
- the strangulation warning is neither common, nor noticeable, at their playgrounds; and
- the newly designed playground equipment is too complex and dangerous for children, and the equipment has too many parts for CPSIs to maintain safely.

4.4 Limitations

The participants may be qualitatively different from the population. Although the participants varied in income and experience, they all came from the same geographic area (the Washington metropolitan area). As is typically the case with focus groups, the participants were not asked all of the intended questions, and several participants dominated the discussions, making it difficult for other participants to provide uninhibited input.

Furthermore, there are inherent biases introduced by the focus group methodology. Research has shown that the social desirability bias, *i.e.*, the desire to be perceived positively by one's peers, presents a significant influence because perceived judgment by others is highest when controversial topics, such as parenting and supervision, are discussed in front of others.[5] The social desirability bias may be evidenced in this study by the unanimous self-reports of careful supervision of children for whom the participants felt responsible, even though they reported frequently observing other guardians regularly being preoccupied with distractions.

By discussing observations of other guardians' practices at playgrounds, and by checking for consistency between each group's responses, the study may have been able to reduce the effect of social desirability bias on this study's findings. The survey will attempt to provide further protection from this bias, advantaged by the veil of anonymity.

4.5 Implications

This research raises awareness of significant concerns that warrant further investigation. The findings suggest that children may be commonly exposed to rubber surfacing materials

[5] Edwards, A. L. (1957). *The Social Desirability Variable in Personality Assessment and Research*. New York: Dryden Press; Fisher, R. J. (1993). Social Desirability Bias and the Validity of Indirect Questioning. *Journal of Consumer Research*, *20*(2), 303-315; King, M. F. & Bruner, G. C. (2000). Social desirability bias: A neglected aspect of validity testing. *Psychology & Marketing*, *17*(2), 79-103.

in various ways, such as chewing the materials and being scraped by them. In discussions about labels at playgrounds, participants claim that age-recommendation labels are disobeyed routinely, and the strangulation warning is rarely seen or recognized. Regarding the newly designed playground equipment, parent and childcare provider participants report that the new equipment is too complicated and dangerous, and CPSI participants find the new equipment difficult to maintain because there are too many parts and connections.

Participants across groups report that supervision is paramount to avoid accidents. It appears that distractions lead to less supervision, and guardians rarely look out for other children on the playground. Participant guardians report that children mouth and chew recycled rubber surfacing and participant CPSIs claim that children climb on top of playground equipment where they are not supposed to climb, and they fall and jump from dangerous heights.

Survey items will address the concerns identified in this study to determine how to generalize the findings (given a representative, nationwide sample) and to acquire additional detail. In turn, data from the survey can be used for quantitative analyses and estimates. For example, nationwide survey research can identify statistics, such as the frequency and duration of children mouthing rubber surfacing materials, and what measures can be taken toward remediation.

Appendix I: Playground Observations

Staff conducted a number of 20-minute naturalistic observations of children at playgrounds in the Washington, DC, metropolitan area with unitary surfaces (bonded rubber or poured-in-place rubber), and loose-fill surfaces (one rubber, one engineered wood fiber) during mornings and afternoons.[6] Observations commenced as soon as three or more children were actively using the playground. No contact was made with any of the children or parents, and consumers were able to enter freely and exit the playgrounds as desired. No photographs were taken. The table below shows the behaviors of interest that were tallied (frequencies) during the playground field observations.

Playground Field Observations	
Behaviors of Interest - duration (> 30 s)	Behaviors of interest – frequency
• Plays (w/surface material) • Plays (w/toy or other object) • Other (exposed) body contact • Crawling • Eating or drinking	• Hand contact • Picks up/throws • Foot contact (barefoot/open toe) • Face/mouth contact (licking, mouthing, etc.) • Falls/jumps to surface

Because the purpose of the field observations was to inform item development for the focus groups, a convenience sample was used, along with a small number of sites and a low frequency of observations at each site (four visits).

Staff observed that hand contact with playground surfaces, by far, was the most common exposure route; and children also frequently played with and threw loose-fill materials. Many children were frequently observed playing with toys that they brought from home, such as trucks and dolls. Although a high frequency of drinking was noted, only some children ate snacks while at the playground. The amount of bare-skin contact with playground surfaces varied considerably and largely depended upon the type of clothing worn. Not surprisingly, children appeared to wear shorts and t-shirts more often on hot days and longer pants and shirts on more moderate/cooler days, particularly in the mornings. Mouthing and other forms of direct contact between a child's face and the playground surface were rare. Anecdotally, staff noted that early elementary school children continue to play with, throw, and lie down on playground surfaces like their younger peers.

[6] CPSC staff acknowledges the cooperation and logistical support from playground owner/operators associated with the Department of Recreation and Parks in Rockville, MD, Montgomery County Department of Parks of Montgomery County, MD, and the Maryland Department of Natural Resources.

Appendix II: Additional Playground Safety Data

Participants were asked to discuss other topics related to playground safety, such as signage and equipment use, which are not related to recycled playground surfacing materials. These topics were addressed to support future research, revisions to voluntary standards, updates to the CPSC *Public Playground Safety Handbook*, and as part of our general focus on playground safety.

Detailed below are additional findings from parents, childcare providers, and CPSIs. The observations mentioned below are solely reports from the participants and do not reflect facts or opinions held by the CPSC.

Caregiver Group 1

Age-recommendation labels. Most participants report frequently seeing the age-recommendation labels at playgrounds (Figure 1). Some say they follow the labels, appreciating separation between ages, so that older children do not knock down younger children. Others ignore the labels, believing the equipment to be intuitive and/or wanting their children to explore and learn their limitations. Those participants who report ignoring the labels are more likely to allow their younger children to go to the older playgrounds with supervision, rather than take their older children to the younger playgrounds. The participants report that most of the other guardians tend to adhere to the age-recommendation labels, although some ignore the labels, especially when they bring children of mixed ages to playgrounds.

Figure 1. Two examples of playground age-recommendation labels provided to the participants by FMG.

Equipment use. When asked about playground equipment use, the participants stated that their children play on monkey bars, slides, shaky bridges, stairs, see-saws, and cube-flipping equipment. Their children love slides the most. The participants reportedly believe that monkey bars and ladders are unsafe, and their children tend to want to use the

equipment before they are old enough to do so safely. As children get older, according to participants, they often exhibit risky, exploratory behaviors, improperly using equipment, such as running up slides backwards.

The participants say they distrust recently designed playground equipment (Figure 2), believing the equipment to be too dangerous for children under age 5. They believe the new designs are too complicated; they see children using the equipment incorrectly and unsafely.

Figure 2. Examples of recently designed playground equipment shown to participants

Strangulation warning. The participants report not being familiar with the strangulation warning (Figure 3). They would expect to see the warning in a conspicuous location, such as by the walkways, benches, park bulletin boards, or entrances to the playgrounds. It would also be useful to place it next to the equipment that is most likely to be a problem.

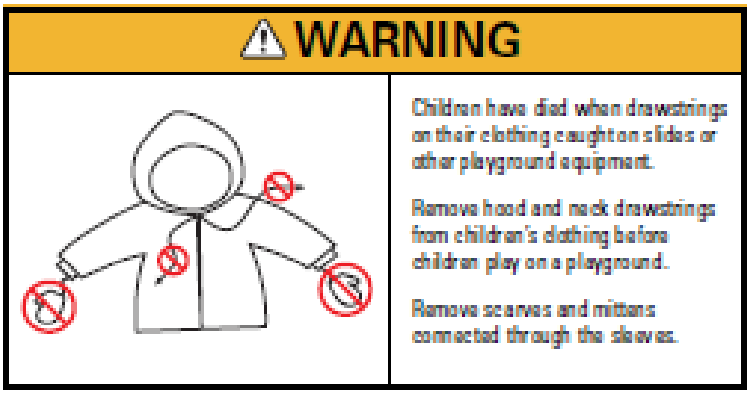

Figure 3. Strangulation warning from the CPSC *Public Playground Safety Handbook* (2010, Section 3.2) as presented to the participants[7]

Caregiver Group 2

Age-recommendation labels. The participants report seeing the age-recommendation labels on their playgrounds. They think it is important to follow the age labels. They claim

[7] CPSC Public Playground Safety Handbook available at: https://www.cpsc.gov/s3fs-public/325.pdf.

other guardians disobey these recommendations and that other guardians tend to think they know best and overestimate their children's capabilities. When the age recommendations are ignored, according to participants, older children are sometimes too rough with younger children, bumping into them. Age recommendations are most likely to be disobeyed when a single guardian goes to the park with multiple children of varying ages. Reportedly, it is more common to see the older children on the younger children's playground equipment than the reverse.

Equipment use. The participants prefer plastic equipment to equipment composed of metal and wood. The children use see-saws, slides, monkey bars, bridges, tunnels, swings, rock-climbing walls, and ride-on equipment. The participants feel that monkey bars, tire swings, and equipment that spins is dangerous, but report that children love these types of playground equipment and do use them nonetheless. Most of the participants report distrust of newly designed playground equipment, viewing these designs to be dangerous with a greater risk for falls and collisions between children. Participants report seeing new equipment being used as intended only about half of the time.

Strangulation warning. None of the participants have seen this warning. They would expect to see this warning on a clothing label, but not at the playground. Most said that strangulation is not common enough at playgrounds to warrant a sign, adding that it is more important to have signs showing how to use equipment properly and safely. They do not think it would be an effective deterrent because children are already clothed when they get to the playground.

CPSIs

Age-recommendation labels. CPSIs are required to display age-recommendation labels. Parents rarely adhere to these recommendations, however; and children run back and forth between playgrounds intended for different ages. They believe guardians pay closer attention to their phones than their children. They also feel that parents lack understanding of the reasoning behind the signs. The participants suggest adding further separation between the playgrounds to help prevent children from using playgrounds that are not appropriate for their age.

New playground equipment. The participants believe that the newly designed equipment is dangerous, due to greater fall and collision risks. The new equipment, they report, tends to have more parts and connections to maintain. CPSIs are reluctant to climb up high, where parts may be loose, because it is dangerous for them to do so. With some equipment, kids tend to dig at the base, exposing attachments at the bottom of the equipment.

Injuries and safety concerns. The primary role of a CPSI is to make sure that playgrounds, including all equipment, are compliant with voluntary standards and state/local safety regulations. CPSIs believe that most injuries occur from falling while running and falling off of playground equipment. For playgrounds with loose-fill surfacing, this requires regularly managing surfacing levels, especially in areas near or adjacent to equipment, for the purpose of impact attenuation.

CPSIs state that all injuries have to be reported, and injuries do not have to be severe to warrant remediation. Even small injuries, like pinches, can lead to repairs and replacements to avoid future injuries and potential litigation. Severe injuries may result in removal or replacement of the equipment, although it is rare for a playground to be closed due to injuries sustained on the playground. If there is damage to equipment or surfacing, dangerous areas are usually just barricaded until the hazard has been eliminated. It is more common for them to replace, rather than repair, damaged equipment.

The participants believe that playground voluntary standards are sufficient. They view falls as inevitable, but report that lack of supervision is the real problem. They claim that parents often impeded safety because use of electronics and socializing lead to less supervision. They have seen children climb on top of playground equipment where they are not supposed to climb and then fall and jump from dangerous heights.