This document has been electronically approved and signed.

United States
Consumer Product Safety Commission

Ballot Vote Sheet

TO: The Commission
Alberta E. Mills, Secretary

DATE: March 29, 2023

THROUGH: Austin C. Schlick, General Counsel
Jason K. Levine, Executive Director

FROM: Daniel R. Vice, Assistant General Counsel, Regulatory Affairs
Mary A. House, Attorney, Regulatory Affairs

SUBJECT: Petitions Requesting Rulemaking on Play Yard Mattress Thickness and Standardizing Size of Play Yards

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BALLOT VOTE DUE: Tuesday, April 4, 2023

CPSC staff is forwarding to the Commission a briefing package assessing two petitions, both submitted by Carol Pollack-Nelson, Ph.D., of Independent Safety Consulting, LLC, Sarah B. Newens, M.S., of Safety and Systems Solutions, LLC, and Alan H. Schoem, Esq. The petitions are: (1) Petition to Require Minimum Thickness for Play Yard Mattresses (Mattress Thickness Petition; CP 22-1), and (2) Petition to Standardize the Size of Play Yards and Play Yard Mattresses (Play Yard Size Petition; CP 22-2).

The Petitioners seek a rulemaking that, they contend, will address the hazard of infants becoming entrapped between the edge of a play yard and the mattress and suffocating, by requiring minimum and maximum play yard mattress thicknesses and a maximum gap measurement between the mattress and the play yard wall, and by limiting the diversity of play yard sizes to reduce consumer confusion in choosing an appropriately sized mattress.

The Commission can grant, defer, or deny each petition. The Staff Briefing Package recommends denying both petitions because Petitioners' proposed amendments to the Safety Standard for Play Yards may decrease the safety of play yards. Please indicate your vote on the following options for each petition.

U.S. Consumer Product Safety Commission
4330 East-West Highway
Bethesda, MD 20814

National Product Testing and Evaluation Center
5 Research Place
Rockville, MD 20850

Regarding the Mattress Thickness Petition, CP 22-1:

I. Deny the petition and direct staff to draft a letter of denial to the petitioner.

(Signature) (Date)

II. Grant the petition and direct staff to begin a rulemaking to revise the mattress thickness requirements in the Safety Standard for Play Yards.

(Signature) (Date)

III. Defer the petition.

(Signature) (Date)

IV. Take other action as specified below.

(Signature) (Date)

Regarding the Play Yard Size Petition, CP 22-2:

I. Deny the petition and direct staff to draft a letter of denial to the petitioner.

_____ _____

(Signature) (Date)

II. Grant the petition and direct staff to begin a rulemaking to revise the Safety Standard for Play Yards to standardize the sizes of play yards, and play yard mattresses, to one size per perimeter shape.

_____ _____

(Signature) (Date)

III. Defer the petition.

_____ _____

(Signature) (Date)

IV. Take other action as specified below.

_____

_____

_____

_____

_____ _____

(Signature) (Date)

Attachment: Staff Briefing Package: Petitions CP 22-1 & CP 22-2: Petitions Requesting Rulemaking on Play Yard Mattress Thickness and Standardizing Size of Play Yards

United States
Consumer Product Safety Commission

Staff Briefing Package
Petitions CP 22-1 & CP 22-2: Petitions Requesting Rulemaking on Play Yard Mattress Thickness and Standardizing Size of Play Yards

March 29, 2023

FOR ADDITIONAL INFORMATION, CONTACT:

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This report was prepared by the CPSC staff. It has not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

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Briefing Memorandum

United States
Consumer Product Safety Commission

This document has been electronically approved and signed.

Briefing Memorandum

TO: The Commission
Alberta E. Mills, Secretary

DATE: March 29, 2023

THROUGH: Austin C. Schlick, General Counsel
Jason Levine, Acting Executive Director
DeWane Ray, Deputy Executive Director for Operations

FROM: Duane E. Boniface, Assistant Executive Director,
Office of Hazard Identification and Reduction

Frederick deGrano, Project Manager
Division of Mechanical and Combustion Engineering,
Directorate for Engineering Sciences

SUBJECT: Petitions CP 22-1 & CP 22-2: Petitions Requesting Rulemaking on Play Yard Mattress Thickness and Standardizing Size of Play Yards

I. Introduction/Background

On November 29, 2021, Carol Pollack-Nelson of Independent Safety Consulting, LLC, Sarah B. Newens of Safety and Systems Solutions, and Alan H. Schoem, Esq. (collectively "Petitioners") petitioned the U.S. Consumer Product Safety Commission (CPSC or Commission) requesting that the Commission use its authority to amend the Commission's regulation, *Safety Standard for Play Yards*, 16 CFR part 1221, to purportedly improve safety.

In two separate petitions, petitioners request the Commission to require a minimum thickness and greater maximum thickness for play yard mattresses (Tab A) and to standardize the sizes of play yards to one size per perimeter shape, *i.e.*, one size for square play yards, one size for rectangular play yards, one size for oval play yards and one size for round play yards (Tab B). On April 27, 2022, the CPSC's Office of the General Counsel docketed the requests for rulemaking as Petitions CP 22-1 and CP 22-2.[1] On May 19, 2022, the Commission published a notice in the *Federal Register* (87 *Fed. Reg.* 30,436) requesting comments. The public comment period closed on July 18, 2022, and CPSC received four comments.

CPSC staff prepared this briefing package in response to the petitions. This memorandum summarizes staff's assessment of the following: the petitioners' proposed requirements pertaining to play yards and play yard mattresses, relevant mandatory and voluntary standards, incident data involving play yards, related hazards and child development, the play yard market,

[1] "Petitions Requesting Rulemaking To Amend the Safety Standard for Play Yards To Require a Minimum Thickness for Play Yard Mattresses, and To Standardize the Size of Play Yards and Play Yard Mattresses; Request for Comments." 87 *Fed. Reg*. 30,436 (May 19, 2022).

and public comments received on the petitions. Additionally, this memorandum provides for the Commission's consideration staff's recommendation for responding to the petitions.

A. Product Description

The mandatory *Safety Standard for Play Yards,* 16 CFR part 1221 (play yard rule), defines a play yard as "a framed enclosure that includes a floor and has mesh or fabric sided panels primarily intended to provide a play or sleeping environment for children; it may fold for storage or travel."[2] Although play yards are sometimes referred to as play pens, portable cribs, or pack and plays, particularly in incident reports, this briefing package only refers to these products as "play yards." CPSC's play yard rule requires that play yards be sold with a mattress unless the play yards are designed exclusively for play and not for sleep and are intended to be used without a mattress. Play yard mattresses manufactured by the original equipment manufacturer (OEM), such as those sold with the play yard, are called OEM mattresses. The play yard rule specifies the requirements for OEM play yard mattresses.

Play yard mattresses purchased separately from the play yard are called after-market play yard mattresses, unless they are a replacement mattress provided or sold by the OEM. After-market play yard mattresses are regulated under the mandatory *Safety Standard for Crib Mattresses*, 16 CFR part 1241 (the crib mattress rule). The crib mattress rule defines an after-market mattress for play yards as "a mattress sold or distributed for a play yard," and further explains that the term "after-market" ". . . does not include a replacement mattress provided or sold by an original equipment manufacturer (OEM) if, and only if, it is equivalent with respect to dimensions, and specifications to the mattress that was provided with the original product."[3]

B. Previous Petitions

On June 16, 2015, the president of Keeping Babies Safe (KBS) and the mother of a child who died in an incident involving an after-market mattress petitioned the CPSC requesting a ban on supplemental mattresses for play yards with non-rigid sides (petition CP 15-2).[4] Those petitioners used the term "supplemental" to mean mattresses that are used either instead of, or in addition to, the original play yard mattress. They alleged that "thicker mattresses create a suffocation hazard because they create a gap between the mattress pad sides and the side of the portable crib where a baby can suffocate when the baby's head falls in such gap while lying in the prone position." Furthermore, the petitioner asserted that "no feasible consumer product safety standard would adequately protect babies from the unreasonable risk of injury and death associated with the product."

CPSC staff prepared a briefing package for petition CP 15-2, recommending that the Commission defer whether to grant or deny the petition, so that staff could work on voluntary standards for crib mattresses and play yards to address the hazards identified in the petition. The Commission voted (3-2) to "take other action," granted the petition, and directed staff to initiate a rulemaking under section 104 of the CPSA to promulgate a mandatory consumer

[2] This term is defined in section 3.1.22 of ASTM F406-19, Standard Consumer Safety Specification for Non-Full-Size Baby Cribs/Play Yards, which is incorporated by reference into CPSC's *Safety Standard for Play Yards*.
[3] Section 3.1.1 of ASTM F2933-21, *Standard Consumer Safety Specification for Crib Mattresses* (incorporated by reference into 16 CFR 1241)
[4] Commission Briefing Package: Petition CP 15-2 - Petition Requesting Ban on Supplemental Mattress for Play Yards with Non-Rigid Sides - May 10 2017_with addendum: https://cpsc.gov/s3fs-public/Petition-CP-15-2-Petition-Requesting-Ban-on-Supplemental-Mattress-for-Play-Yards-with-Non-Rigid-Sides-May-10-2017_with-addendum.pdf?VersionId=A5jHAF103hZufDVuoRTKsfT9nu9dk4ly.

product safety standard to address the risk of injury associated with the use of crib mattresses.[5] The Commission directed that the scope of the rule "shall include crib mattresses, as well as supplemental and after-market[6] mattresses used in play yards and portable cribs." The Commission issued a mandatory standard for crib mattresses that addresses after-market play yard mattresses, which became effective August 15, 2022 (16 CFR part 1241). Section I.C.2. below details the crib mattress rule in more detail.

C. Regulations and Voluntary Standards (Tabs D & F)

1. ASTM F406 and 16 CFR Part 1221

Play yards are subject to the mandatory *Safety Standard for Play Yards*, 16 CFR part 1221, which incorporates by reference ASTM F406-19, *Consumer Safety Specification for Non-Full-Size Cribs/Play Yards*, as described in Tabs D and F.[7]

The play yard rule specifies multiple requirements for OEM play yard mattresses to ensure their safe use.[8] The rule requires play yards to be sold with a mattress unless they are designed exclusively for play and not for sleep and are intended to be used without a mattress.[9] For OEM mattresses included with a play yard, the mattress thickness including all fabric or vinyl layers, filling material, and structural members shall be no more than 1.5 inches with a maximum of 1 inch of filling material of the mattress, such as foam or fiberfill.[10] If a play yard includes accessories such as a bassinet or changing table, those accessories must comply with the applicable requirements of ASTM standards addressing those accessories.[11] Because some play yards use the same mattress for both in the play yard and in a bassinet feature, the mattress supplied with the play yard shall comply with both the play yard and bassinet standards.

In November 2022, ASTM published ASTM F406-22, which includes multiple updates to ASTM F406-19. Relevant to this petition, ASTM F406-22 increases the maximum mattress thickness to 2 inches and states that mattresses 1.5 inches to 2 inches in thickness shall not form a gap between the mattress and sidewall greater than ½ inch when measured with the mattress centered in the manufacturer's recommended use position. The gap measurements are taken with no force applied to the sidewall. Unlike the requirement in ASTM F406-19, the new

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[5] https://www.cpsc.gov/s3fs-public/RCA-Petition_CP_15-2_Requesting_Ban_on_Supplemental_Mattresses_for_Play_Yards_with_Non-Rigid_Sides_052517.pdf

[6] The term "supplemental" refers to the use-pattern of a product, which could be "supplementing" an existing mattress or "supplementing" the play yard itself. Staff believes that "supplemental" is more descriptive of the use-pattern; whereas, "after-market" is more descriptive of how the mattress is sold, i.e., independent of the play yard or crib in which it is used. Therefore, staff concludes that the term "after-market mattress" more clearly indicates any mattress sold independently from a play yard or crib that can be used as a sleeping surface inside the play yard or crib, whether used alone or with the original mattress. In addition, "after-market mattress" is the term defined in ASTM F2933-19 to include mattresses that are sold independently of play yards or non-full-size cribs.

[7] Revisions to Safety Standards for Non-Full-Size Baby Cribs and Play Yards (2019) (84 *Fed. Reg.* 56,684): https://www.federalregister.gov/documents/2019/10/23/2019-23088/revisions-to-safety-standards-for-non-full-size-baby-cribs-and-play-yards

[8] The play yard rule also specifies marking, labeling, and instructional literature requirements regarding suffocation and positional asphyxiation, including warnings explaining that infants can suffocate on soft bedding and in sidewall gaps involving an ill-fitting mattress (ASTM F406-19, section 9). The rule also contains required warnings directing consumers to never add a mattress, pillow, comforter, or padding to the play yard.

[9] ASTM F406-19, section 5.16.1

[10] ASTM F406-19, section 5.16.2

[11] ASTM F406-19, section 1.2

mattress thickness requirement in ASTM F406 does not specify a maximum thickness of the mattress filling material relative to structural members. Therefore, under the ASTM F406-22 voluntary standard, a play yard mattress may have filling material measuring up to 2 inches in thickness with no structural members.

On February 15, 2023, pursuant to section 104(b)(4) of the Consumer Product Safety Improvement Act of 2008 (CPSIA), staff provided a briefing package to the Commission detailing staff's assessment of the updated requirements of ASTM F406-22.[12] Staff recommended that the Commission reject the ASTM F406-22 revision and retain ASTM F406-19 as the mandatory standard for play yards because the new revision is a net reduction in safety. Specifically, staff concluded that the requirements for OEM play yard mattresses above 1.5 inches do not account for gap entrapment based on the flexible nature of play yard sidewalls and do not account for suffocation hazards associated with increased softness of thicker mattresses. On February 22, 2023, the Commission voted unanimously (4-0) to not accept ASTM F406-22 as the new mandatory standard for play yards.[13]

2. ASTM F2933 and 16 CFR Part 1241

After-market mattresses for play yards are subject to the mandatory *Safety Standard for Crib Mattresses* (crib mattress rule), 16 CFR part 1241, which went into effect on August 15, 2022. The rule incorporates by reference ASTM F2933-21, *Standard Consumer Safety Specification for Crib Mattresses*, with modifications to make the standard more stringent.[14] The crib mattress rule requires that all after-market play yard mattresses meet the same requirements as OEM play yard mattresses in ASTM F406, and also adds a test for mattress firmness that is not found in the ASTM F406 standard for OEM mattresses. The crib mattress rule requires after-market play yard mattresses be tested with the play yard product with which they are intended to be used. Both the after-market mattress and play yard are required to meet the following requirements of the play yard rule: Stability; Cord/Strap Length; Mattress; Height of Sides; Floor Strength; and Mattress Vertical Displacement. Section III.B.2. below details these requirements.

The crib mattress rule also requires that after-market play yard mattresses must contain warning labels identifying the brand(s) and model number(s) of the play yards in which the mattress is intended to be used. Additionally, these warning labels must be included on the retail packaging or visible when the product is in the retail packaging.

Because the crib mattress rule states that after-market play yard mattresses must follow certain mandatory requirements for OEM play yard mattresses that are based on ASTM F406, including requirements for mattress thickness, if the Commission modifies the requirements for OEM play yard mattresses in the mandatory standard for play yards, these requirements will also apply to after-market play yard mattresses.

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[12] Commission Briefing Package: ASTM's Notice of a Revised Voluntary Standard for Play Yards – Feb 2023: https://cpsc.gov/s3fs-public/ASTMs-Notice-of-a-Revised-Voluntary-Standard-for-Play-Yards.pdf?VersionId=ogcqd17VstU50PjFj_jXZkfJ67ZI4tki

[13] Record of Commission Action – ASTM's Notice of a Revised Voluntary Standard for Play Yards – Feb 2023: https://cpsc.gov/s3fs-public/RCAASTMsNoticeofaRevisedVoluntaryStandardsforPlayYards.pdf?VersionId=UrH80dJb8mmt8PXXzLLDP28zzQ4L2DIe

[14] Note: there is a revision of ASTM F2933 – 21, *i.e.,* ASTM F2933 – 21a; however, it is not incorporated into the *Safety Standard for Crib Mattresses*

II. Hazard Information

A. Incident Data (Tab C)

As discussed in Tab C, staff conducted an incident data search to identify reports of injuries or fatalities involving gap entrapment between the mattress and sidewall for play yards occurring between January 1, 2010, and July 31, 2022. The data include incident reports obtained by the CPSC through the Consumer Product Safety Risk Management System (CPSRMS) and the National Electronic Injury Surveillance System (NEISS) databases. Staff identified 24 incidents resulting in a fatality and 61 incidents resulting in nonfatal injury. Table 1 below summarizes the incident reports staff identified, and Tab C provides a summary of the 24 fatal incident reports. The nonfatal incidents include 14 reports which discuss either a gap present or a wedge entrapment of at least some body part between a mattress and an end and/or sidewall of the play yard. Tabs D and E provide detailed analyses on specific incident reports.

Table 1. Reported Fatal and Nonfatal Incidents Related to Fit Issues Involving a Mattress Product Being Used in a Play Yard: January 1, 2010–July 31, 2022

Role of Play Yard	Number of Reported Fatalities	Number of Reported Nonfatal Incidents
Wedged/Entrapment or Gap Present Between Mattress and End/Sidewall of Play Yard	**21**	**14**
Original Equipment Manufacturer (OEM) Play Yard Mattress	*2*	9
Aftermarket Mattress	*13*	5
Unknown or Vague Description Account of the Mattress	*6*	0
Mattress Shifted Allowing Contact or Entrapment with the Mesh Bottom of the Play Yard	***3***	**39**
Child moved the mattress up and had at least some body part trapped under the mattress	*3*	*30*
Mattress will not lay flat	*0*	*9*
Fitted Sheet or Mattress Cover/Protector/Topper Issue	**0**	**8**
Total Reported Fatalities	**24**	**61**

The CPSRMS incident reports identified 21 fatalities in which infants' arms, shoulders, torsos, faces, and heads were trapped in play yard sidewall gaps, resulting in positional asphyxia. These victims ranged from 1 month to 11 months in age. The majority of the victims were between 2 months and 6 months of age (14 victims). At least two cases involved entrapment in a corner. Two cases reportedly involved only the OEM mattress; however, these cases had multiple contributing factors to injury, such as the OEM mattress being used in the play yard's hanging bassinet mode in one case, and the OEM mattress potentially not being secured to the play yard floor in the other case. At least 13 cases involved after-market mattresses, and at least 2 of these 13 cases involved a full-size crib mattress. At least 12 cases involved the use of multiple mattresses. In at least nine cases, soft bedding or padding, such as blankets, were used in play yards for comfort, warmth, or other reasons, including cases in which soft bedding or padding was used with after-market mattresses. Static gap measurements were provided in

several reports, ranging from 1 inch to 10 inches in width.[15] Similar to CPSC staff's previous incident data analyses involving play yards,[16] in most cases, it is unknown how thick the involved mattresses were and how big the sidewall and corner gaps were, particularly what those gaps would have been with horizontal force applied against the sidewalls as could be generated by the weight of an infant's head and/or body leaning against the sidewall.

The CPSRMS reports included three nonfatal entrapment incidents that involved infants "wedged" or "stuck" in the sidewalls of play yards. In each case, the play yard was in a bassinet mode, or the victim was otherwise in a bassinet in a play yard. One victim was 3 months old; another was 4 months old, and the age is unknown for the third victim. All three cases involved head entrapment.

Staff identified one NEISS report that involved an injury associated with play yard gap entrapment, and it is unclear what occurred beyond a 6-month-old male's foot being caught between "cardboard and mattress" of a play yard. While staff identified only this one relevant NEISS report, staff notes that NEISS reports typically contain only brief narratives culled from medical records developed during the emergency department visit, and, therefore, it is not uncommon for such details to be left out of NEISS data.

Staff did not find any recalls of OEM or after-market play yard mattresses in the period January 1, 2018, through December 31, 2022.

Based on CPSC's annual report for nursery product-related injury estimates for 2021, staff found similar reports of fatalities in baby cribs involving asphyxiation from soft bedding.[17] Of the 137 deaths reported between 2017-2019 involving baby cribs, about 73 percent of the reports were associated with a sleep environment that included extra bedding in the sleep environment such as pillows, blankets, and/or comforters, among others, and led to the asphyxiation of the infant.

B. Injury Mechanisms

In Tab E, staff of CPSC's Directorate for Health Sciences, Division of Pharmacology and Physiology Assessment (HSPP) discusses the injury mechanisms associated with incidents related to gap entrapment and soft bedding. Based on staff's review of the incident data, the official cause of death of many of the incidents is listed as positional asphyxia. Positional asphyxia is a type of asphyxia associated with abnormal body position, where the position of the subject compromises adequate breathing.[18] Death is caused by body position that prevents adequate gas exchange or causes direct obstruction of the airways (e.g., smothering by an object) and by the failure or inability to move to another position. Asphyxia in infants can result from covering of the mouth and nose with soft bedding, overlay, entrapments, wedging of the

[15] Note: IDI 160812HCC2772 has conflicting information so it is unclear what exactly transpired. According to the Sheriff's detectives, the victim's mother initially reported the sidewall gap was 1 inch in width, and the victim was found on his side with his face against the play yard's mesh side. The victim's mother later reported that the sidewall gap was ½ inch and denied that the victim was stuck in the gap with his face against the play yard side.
[16] See Commission Briefing Package: Petition CP 15-2 - Petition Requesting Ban on Supplemental Mattress for Play Yards with Non-Rigid Sides - May 10 2017_with addendum: https://cpsc.gov/s3fs-public/Petition-CP-15-2-Petition-Requesting-Ban-on-Supplemental-Mattress-for-Play-Yards-with-Non-Rigid-Sides-May-10-2017_with-addendum.pdf?VersionId=A5jHAF103hZufDVuoRTKsfT9nu9dk4ly.
[17] See CPSC report: Injuries and Deaths Associated with Nursery Products Among Children Younger than Age Five – November 2022: https://www.cpsc.gov/s3fs-public/Nursery-Products-Annual-Report-2022.pdf?VersionId=48HfEaAG2znYilGMU6I9EC.z8UMAe4Oy.
[18] Multiple sources (see Tab E): (1) Chmieliauskas et al. (2018); (2) Gordon (1982); (3) Gordon (1975)

head with mouth and nose pressed into bedding, strangulations, and prone or side positioning. Death as a result of positional asphyxia can occur in as little as two to three minutes.

An excessive gap is a recognized entrapment hazard that can cause death by positional asphyxia/suffocation. Infants found in this compromised position, with their nose and mouth pressed against the mattress or play yard side and head, torso, arm, and/or leg entrapped in a gap caused by an ill-fitting mattress are likely to remain in this position and experience compromised airflow, which creates unfavorable respiratory and cardiac dynamics. Thick mattresses, multiple mattresses, and additional bedding used to raise the level of the sleeping surface can pose additional risks by increasing the chances of forming a larger pocket between the edge of a mattress and the sidewall of a play yard. Infants can asphyxiate against soft bedding if the nose and mouth are engaged against soft bedding or the mattress within the gap, which occludes the airway and prevents breathing.[19] Sustained pressure on the neck by the weight of the mattress can lead to asphyxia by strangulation.[20]

Infants are at risk of asphyxia when placed in a prone or side position on soft bedding, which can occlude the airway (mouth and nose). Infants can also unexpectedly roll and be unable to reverse action and extract themselves from a hazardous situation because either the presence of excess soft bedding prevents it, or the infant is physically incapable of rolling back. For example, a 5-month-old infant was found face down and unresponsive on a sagging, secondhand cot which had formed a trough. Surrounded by excess bedding, including a soft foam mattress, pillows, and layers of soft bedding, the victim asphyxiated.[21]

As discussed in Tab D, staff assesses that limb entrapment may present another hazard pattern for positional asphyxia. Based on staff's incident data analysis, fatal sidewall gap entrapment incidents have involved infants' arms, shoulders, torsos, faces, and heads being trapped, resulting in positional asphyxia.[22] While known fatal sidewall gap entrapment victims ranged from 1 month to 11 months in age, the majority of the victims were between 2 months and 6 months old. As explained in staff's 2017 response to Petition CP 15-2, *Petition Requesting Rulemaking on Supplemental Mattresses for Play Yards with Non-Rigid Sides*,[23] these ages are particularly at risk for maneuvering into hazardous positions from which they cannot extricate themselves, such as sidewall gaps.

Incident reports[24] do not reveal whether the known sidewall gap entrapment incidents causing death or injury have resulted from arm entrapment absent face or head entrapment. However, as staff has expressed in ASTM meetings,[25] arm entrapments can lead to death or serious injury through positional asphyxia when the infant's airway is occluded by the mattress or bedding, for instance if the infant is lying prone face down with their upper arm trapped in a sidewall gap and lacks the strength to raise or turn their head or free their arm. Arm entrapment

[19] Multiple sources (see Tab E): (1) Wanna-Nakamura; (2) Gilbert-Barnes (1991); (3) Hauck et al. (2003); (4) Byard et al. (1994); (5) Fleming et al. (1996)
[20] Multiple sources (see Tab E): (1) Camps et al. (1959); (2) Iserson (1984)
[21] Combrinck M, Byard RW. Infant asphyxia, soft mattresses, and the "trough" effect. Am J Forensic Med Pathol. 2011 Sep;32(3):213-4. doi: 10.1097/PAF.0b013e31822abf68. PMID: 21817867.
[22] Example IDI #s: 140702CCC3689, 190603HCC1480, and 181105HCC3067 are detailed in the appendix to Tab C.
[23] Commission Briefing Package: Petition CP 15-2 - Petition Requesting Ban on Supplemental Mattress for Play Yards with Non-Rigid Sides - May 10 2017_with addendum: https://cpsc.gov/s3fs-public/Petition-CP-15-2-Petition-Requesting-Ban-on-Supplemental-Mattress-for-Play-Yards-with-Non-Rigid-Sides-May-10-2017_with-addendum.pdf?VersionId=A5jHAF103hZufDVuoRTKsfT9nu9dk4ly.
[24] For example, see summary of IDI 160812HCC2772 in the appendix.
[25] Staff meeting log for Meeting of the ASTM Play Yard Mattress Fit & Thickness Task Group Call on October 4, 2018: https://cpsc.gov/s3fs-public/2018-10-04-ASTM-Play-Yard-Mattress-Fit-and-Firmness-Task-Group.pdf?VersionId=D2GZwqHuMKKiQsMLKHJiX9J0GkwSfwyW

could also increase the likelihood of face or head entrapment through wedging and gap expansion.

Based on the most recent Centers for Disease Control and Prevention (CDC) anthropometric reference data, the 10th percentile mid-upper arm diameter for male infants 2 months to 5 months of age is approximately 1.55 inches, and the 10th percentile mid-upper arm diameter for female infants 2 months to 5 months of age is approximately 1.5 inches.[26] Therefore, staff assesses that an infant's arm can become trapped in a gap measuring more than1.5 inches wide and more than 1.5 inches deep, resulting in positional asphyxia. Staff assesses that hazardous sidewall entrapment is unlikely to occur with play yards and play yard mattresses compliant with the existing regulation (16 CFR part 1221) because (1) compliant mattresses have a maximum thickness of 1.5 inches and are typically under 1.5 inches in thickness to address manufacturing variance;[27] (2) an infant would need an unusually small arm (10th percentile female 2 months to 5 months of age) to become entrapped; and (3) the requirement for only 1 inch of soft filling material would result in very limited inward deflection of the mattress sidewall in the case of a wedged limb (compared to mattresses with more soft filling material, which could deflect more inward from an infant pushing against the material). As discussed in the following sections, increasing the thickness of play yard mattresses as proposed by the Petitioners could pose a greater risk for sidewall gap entrapment and other hazards.

III. Assessment of the Petitions

A. Petition CP 22-1 – Mattress Thickness Petition

1. Petition Summary (Tab A)

Petition CP 22-1, titled *Petition to Require Minimum Thickness for Play Yard Mattresses* (Mattress Thickness Petition), requests that the CPSC amend the mandatory rule for play yards to require a minimum thickness of 1.5 inches and maximum thickness of 3 inches for play yard mattresses. The petitioners assert that consumers perceive play yard mattresses to be uncomfortable because the padding is too thin and firm, resulting in consumers adding soft bedding to play yards, and, thereby, creating an unsafe environment that poses, among other risks, suffocation, such as from positional asphyxia.[28]

The petitioners request that the Commission update 16 CFR part 1221 such that play yard mattresses must have a minimum mattress thickness of 1.5 inches (with "minimal" tolerance) and a maximum thickness of 3 inches. Furthermore, the petitioners request that the Commission require a maximum sidewall gap of 0.5 inches to prevent sidewall entrapment. The petitioners state that mattresses measuring 2 to 3 inches thick that properly fit in their play yards

[26] Fryar, C.D., Carroll, M.D., Gu, Q., Afful, J., Ogden, C.L. (2021). Anthropometric reference data for children and adults: United States, 2015–2018. National Center for Health Statistics. Vital Health Stat 3(46). The CDC Anthropometric Reference is based on a nationally representative sample of the U.S. population, and the 2021 version is based on data collected from 2015 through 2018. According to this data, the 10th percentile mid-upper arm circumference for male infants 2 months to 5 months of age is 12.4 cm, and the 10th percentile mid-upper arm circumference for female infants 2 months to 5 months of age is 12 cm.

[27] As the petitioners noted, manufacturers in the ASTM F15.18 subcommittee have stated that their play yard mattresses are typically thinner than 1.5 inches due to manufacturing variance, in some cases with only 0.5 to 0.75 inches of filling material, in order to ensure their products are in compliance with 16 CFR part 1221.

[28] For more information about the subject hazards, see the Health Sciences memorandum (Tab E; Johnson, 2023).

(*i.e.,* with a gap between the side of the mattress and the mesh side of a play yard no greater than 1 inch) have been used safely in play yards over the past decade. The petitioners also assert that no warning can overcome alleged consumer perception that the existing thickness allowance for play yard mattresses is too thin and uncomfortable for their infants.[29]

2. Background (Tab F)

CPSC staff has been working with ASTM to address the hazardous use of soft bedding, supplemental mattresses, ill-fitting mattresses, and other concerns associated with the alleged consumer perception that infant sleep areas lacking these additional products may be uncomfortable for infants. As discussed in Tab F, similar to the petitioners' requests, ASTM balloted new requirements for mattress thickness in ballot F15 (22-01), Item 5, which closed on February 14, 2022. The ballot proposed increasing the maximum mattress thickness to 2 inches and limiting the sidewall gap to no more than 0.5 inches (when the mattress is centered in the play yard). CPSC staff voted negative on the ballot and submitted a letter to ASTM explaining that the ballot does not account for the sidewall deflection from an occupant leaning against the sidewall (see ASTM F406-22, section 8.32). Staff explained their concern that an infant rolling/leaning against the flexible mesh sidewall could create a hazardous gap/pocket and the risk of entrapment of the head, arm, and/or torso as shown below in Figure 1.

[29] The petitioners also referred to several of CPSC staff's recent briefing packages and is summarized in Tab D: (1) Petition CP 15-2 - Petition Requesting Ban on Supplemental Mattress for Play Yards with Non-Rigid Sides - May 10 2017_with addendum: https://cpsc.gov/s3fs-public/Petition-CP-15-2-Petition-Requesting-Ban-on-Supplemental-Mattress-for-Play-Yards-with-Non-Rigid-Sides-May-10-2017_with-addendum.pdf?VersionId=A5jHAF103hZufDVuoRTKsfT9nu9dk4ly; (2) Notice of Proposed Rulemaking - Safety Standard for Crib Mattresses: https://cpsc.gov/s3fs-public/Notice-of-Proposed-Rulemaking-Safety-Standard-for-Crib-Mattresses.pdf; (3) Final Rule - Safety Standard for Crib Mattresses: https://cpsc.gov/s3fs-public/Final-Rule-Safety-Standard-for-Crib-Mattresses.pdf?VersionId=62bEXbfu7.mIoiiLfn_fbMWtFnEsgGON

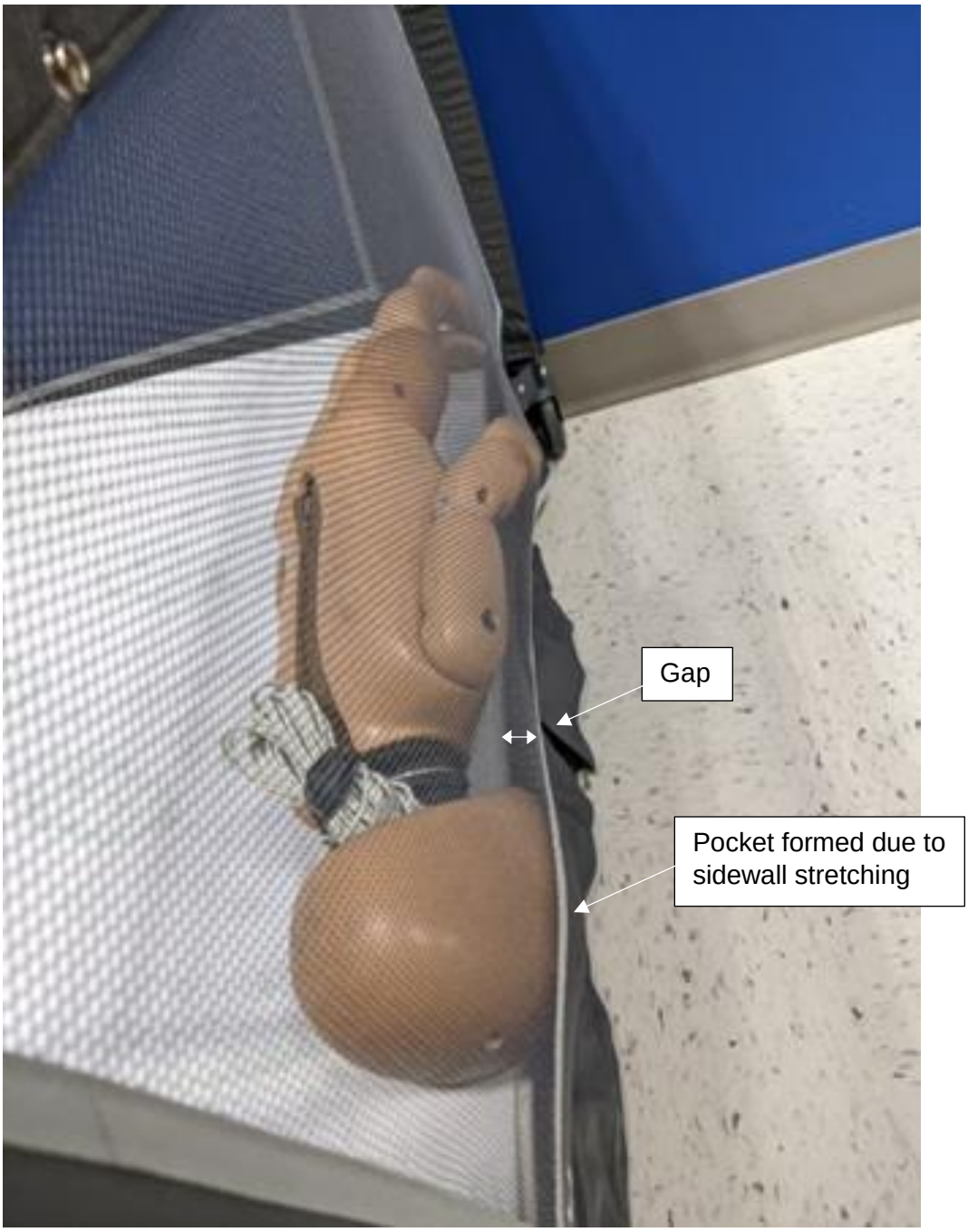

Figure 1. CRABI dummy positioned against the sidewall increases the gap between the mattress and sidewall.

In a follow-up letter to staff's negative vote, CPSC staff recommended a test procedure involving the application of lateral force to the play yard sidewalls to simulate a child rolling into or leaning against the sidewalls.[30] On May 25, 2022, the subcommittee rejected staff's recommended test protocol, with some members stating that incident data show no hazard patterns with gaps less

[30] https://www.cpsc.gov/s3fs-public/CPSC-Proposed-Test-Method-for-F406-19-Revisions-Mar-7-2022.pdf?VersionId=JfL8XDdMdaOWlQjFj6E68Dm3X5HuxeQf

than 2 inches.[31] The subcommittee and the F15 committee found staff's negative vote non-persuasive and voted to approve the requirements as balloted on August 9, 2022.[32]

On December 5, 2022, ASTM informed CPSC of the revisions to the voluntary standard for play yards. CPSC staff submitted a briefing package to the Commission on February 15, 2023, addressing the revision and CPSC staff's concerns stated above, including the increased risk of suffocation absent a firmness requirement for OEM play yard mattresses.[33] On February 22, 2023, the Commission voted unanimously (4-0) to not accept ASTM F406-22 as the new mandatory standard for play yards.[34]

3. Expansion of Gap Due to Flexible Sidewalls (Tab F)

As discussed above and in Tab F, staff is concerned that increasing mattress thickness will increase the risk of gap entrapment due to the flexible nature of play yard mesh sidewalls. To demonstrate the amount of deflection and expansion of the gap between the mattress and sidewall, staff tested various play yard samples by applying a reasonable outward force on the sidewall and measuring the resulting gap. Based on calculations and empirical test data, staff determined that 5 pounds is an appropriate lateral force to apply to the play yard side to simulate an infant rolling to the edge of the mattress and leaning his/her weight onto the mesh sidewall as shown below in Figure 2. This force is representative of a 95th percentile 3–5-month-old weighing 20.2 pounds leaning against the sidewall.

[31] https://cpsc.gov/s3fs-public/2022-05-25%20%20ASTM%20F15.18%20Play%20Yard%20ASTM%20Subcommittee.pdf?VersionId=.9fhWAMSE5wYWEhw2eJSgfCEHRwJidaU

[32] ASTM voting rules states that all negative votes need to be accompanied by a written statement that explains the negative. The negative vote can be withdrawn by the voter after meeting discussion, can be found persuasive by the subcommittee which will withdraw the item from the ballot, or can be found non-persuasive and withdrawn by the subcommittee by two-thirds vote.

[33] Commission Briefing Package: ASTM's Notice of a Revised Voluntary Standard for Play Yards – Feb 2023: https://cpsc.gov/s3fs-public/ASTMs-Notice-of-a-Revised-Voluntary-Standard-for-Play-Yards.pdf?VersionId=ogcqd17VstU50PjFj_jXZkfJ67ZI4tki

[34] Record of Commission Action – ASTM's Notice of a Revised Voluntary Standard for Play Yards – Feb 2023: https://cpsc.gov/s3fs-public/RCAASTMsNoticeofaRevisedVoluntaryStandardsforPlayYards.pdf?VersionId=UrH80dJb8mmt8PXXzLLDP28zzQ4L2DIe

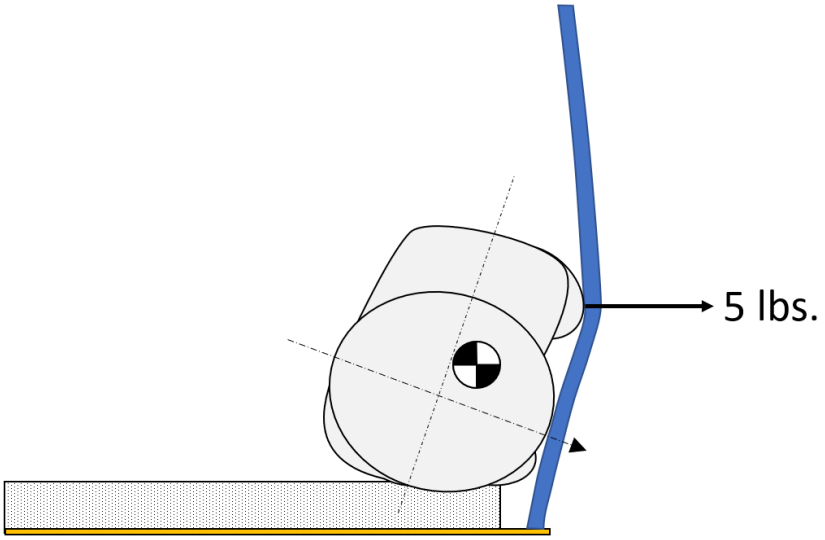

Figure 2. Five-pound force on sidewall due to the infant leaning against the sidewall

Staff applied a 5-pound force on four play yard samples at various heights above the floor representing various thicknesses of play yard mattresses, as shown below in Figure 3. Table 2 below describes the resulting gaps between the mattress and sidewall. Staff found that the resulting gap measured between 1.77 and 2.83 inches when tested 2 inches above the play yard floor and found that the gap increased when the force was applied 3 inches above the play yard floor. This demonstrates that a realistic force from a 5-month-old infant leaning longitudinally against the mesh sidewall can expand the gap between the mattress and sidewall by significantly more than the petitioners' proposed maximum of 0.5-inch gap. Moreover, these data demonstrate that the flexibility of play yard mesh sidewalls varies inconsistently within a product and by product, and typically the flexibility increases at points further up the side of the play yard wall. The looser the play yard mesh, the larger the potential side gap when an appropriate force is applied. Accordingly, adopting a mandatory standard allowing a 0.5-inch gap would result in substantially larger gaps in real-world use, especially with mattresses that are 2 inches or thicker.

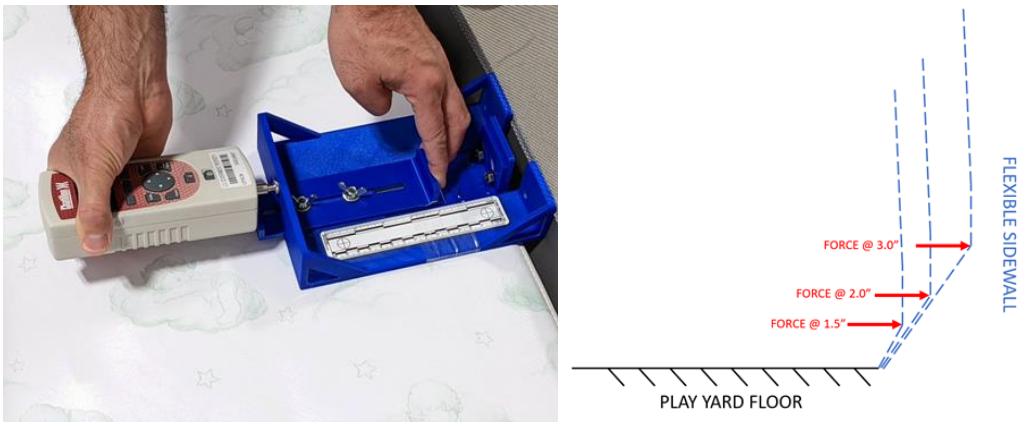

Figure 3. Force application using CPSC's proposed sliding gauge to measure the gap between the mattress and sidewall (left); gap becomes larger with force applied higher above play yard floor (right)

Table 2. Play Yard Sidewall Deflection Data

Play Yard Sample	Wall	Average Gap w/o Force Applied	Average Gap Measurement with 5-lb. Force (inches)		
			1.5" Above Floor	2" Above Floor	3" Above Floor
A	Head	0.375	1.77	2.54	2.83
	Left	0.345	1.54	2.00	2.21
	Right	0.315	1.48	1.94	2.17
	Toe	0.470	1.73	2.48	2.90
B	Head	0.310	2.02	2.58	2.63
	Left	0.250	1.29	1.77	1.75
	Right	0.250	1.40	2.00	1.85
	Toe	0.310	1.83	2.23	2.21
C	Head	0.280	1.65	2.50	2.54
	Left	0.345	1.63	2.02	2.04
	Right	0.345	1.60	2.06	2.06
	Toe	0.280	1.77	2.75	2.81
D	Head	0.470	1.71	2.83	2.96
	Left	0.315	1.40	2.02	2.19
	Right	0.375	1.44	1.96	2.29
	Toe	0.405	1.88	2.46	2.52

4. Mattress Firmness (Tab F)

As discussed in Tab F, staff is also concerned that increasing the maximum mattress thickness to 3 inches may increase the likelihood of softer mattresses and the risk of positional asphyxia involving infants suffocating when face down in a soft mattress. Additionally, softer mattresses may also deflect inward from the sides as a result of an infant rolling into a sidewall, increasing the potential gap created by the flexible sidewall, thereby exacerbating gap entrapment. The

mandatory crib mattress rule requires a firmness test intended to prevent the hazard of positional asphyxia involving infants suffocating when face down in a soft mattress that can conform to an infant's face. While this firmness test applies to after-market play yard mattresses, OEM mattresses that come included with play yards are not within the scope of the crib mattress rule, 16 CFR part 1241, and are therefore not subject to the mattress firmness test.

Staff completed testing to assess the safety of a ASTM F406-22's new requirements for mattresses 1.5 inches to 2 inches in thickness in regards to mattress firmness.[35] Staff conducted mattress firmness tests in accordance with the crib mattress mandatory standard (16 CFR part 1241, § 1241.2(14)(i)) on mattress samples, including OEM mattresses less than 1.5 inches thick, and after-market mattress samples approximately 2 inches in thickness (*i.e*., thicker than ASTM F406-19 and CPSC's mandatory crib mattress rule currently allow).[36] Table 3 below summarizes the test results. Staff found that mattresses that comply with the current play yard rule passed the firmness test, whereas mattresses with up to 2 inches of filling material failed. The 2-inch after-market mattresses consistently failed the firmness test because of a combination of being too soft and lacking a rigid structural layer, and thus, they tended to sag in between the rigid bars supporting the play yard floor. This creates a hazardous sleep environment, where infants can become entrapped face-down in these concavities and be unable to extricate themselves, creating the risk of suffocation.

[35] Commission Briefing Package: ASTM's Notice of a Revised Voluntary Standard for Play Yards – Feb 2023: https://cpsc.gov/s3fs-public/ASTMs-Notice-of-a-Revised-Voluntary-Standard-for-Play-Yards.pdf?VersionId=ogcqd17VstU50PjFj_jXZkfJ67ZI4tki

[36] ASTM F406-22's new mattress thickness requirement as worded does not specify a maximum thickness for filling material such as foam or fiberfill, and therefore, can allow for a mattress with up 2 inches of filling material and no structural layers such as wood or hardboard

Table 3. Mattress firmness test results.

Mattress	Thickness (inches)		Pass/Fail Firmness Test
A	Filling Material:	0.50	Pass
	Structural:	0.25	
	Total:	0.75	
B	Filling Material:	0.25	Pass
	Structural:	0.25	
	Total:	0.50	
C	Filling Material:	0.375	Pass
	Structural:	0.375	
	Total:	0.75	
D	Filling Material:	1.875	Fail
	Structural:	0	
	Total:	1.875	
E	Filling Material:	1.875	Fail
	Structural:	0	
	Total:	1.875	
F	Filling Material:	2.0	Fail
	Structural:	0	
	Total:	2.0	

5. Consumer Behavior (Tab D)

In Tab D, staff of CPSC's Directorate for Engineering Sciences, Division of Human Factors (ESHF) discusses data and research on consumer behavior regarding adding soft bedding to their children's sleep environment and following safety labels and warnings. The petitioners referred to the 2014 "Durable Nursery Products Exposure Survey (DNPES): Final Summary Report," by Westat.[37] The DNPES report detailed the findings of a survey conducted in 2013, which collected information about consumers' use of durable infant and toddler products where participants were asked about items added to sleep products under their children. The researchers found that it was common for consumers to report adding soft bedding materials under children in play yards as well as cribs. This is important to consider because cribs typically have mattresses measuring 3 inches to 6 inches in thickness. This practice is also evidenced in CPSC incident data from CPSC's annual report for nursery product-related injury estimates for 2021 as discussed above where staff found similar reports of fatalities in baby cribs involving asphyxiation from soft bedding.[38] Of the 137 deaths reported between 2017-2019 involving baby cribs, about 73 percent of the reports were associated with a cluttered sleep environment that led to asphyxiation of the infant. These reports involved items including extra bedding in the sleep environment, such as pillows, blankets, and/or comforters, among others.

[37] The report, "Durable Nursery Products Exposure Survey (DNPES): Final Summary Report," with CPSC staff's statement, can be accessed using the following URL: https://www.cpsc.gov/s3fs-public/DurableNurseryProductsExposureSurveyDNPESFinalSummaryReport2014.pdf?VersionId=5R29kvpEAB20KnHt6tFzyTXsKxTvRJsM (or see CPSC.gov, "Other Technical Reports").

[38] See CPSC report: *Injuries and Deaths Associated with Nursery Products Among Children Younger than Age Five* – November 2022: https://www.cpsc.gov/s3fs-public/Nursery-Products-Annual-Report-2022.pdf?VersionId=48HfEaAG2znYilGMU6I9EC.z8UMAe4Oy

Similarly, the 2019 report, "Consumer Product Safety Commission (CPSC): Caregiver Perceptions and Reactions to Safety Messaging Final Report" (Safety Messaging Report) by Fors Marsh Group,[39] also showed that caregivers commonly add soft bedding to cribs as well as play yards, such as for comfort and warmth. The Safety Messaging Report summarizes focus group research (six in-person focus groups) and a literature review conducted in 2019 pertaining to safe sleep practices in various products, including cribs and play yards. This study found that many participants did whatever it took to ensure their infants were "comfortable" and slept. Overall, the participants reported they perceived cribs and play yards to have hard surfaces that are not comfortable for their infants and laying a blanket down or purchasing a "comfortable" mattress were commonly reported additions to the sleep environment to make it more comfortable. The study found that most of the participants stated that they acted contrary to the warnings, and some participants stated they typically skimmed or skipped warnings. The Safety Messaging Report recommended improving safety messaging by making warnings and marketing clear, concise, and consistent.

Based on the incident reports and consumer research, caregivers add soft bedding to sleep areas for various reasons in addition to perceiving the mattress as too firm, such as to cover the mattress and to provide warmth. The use of soft bedding on crib mattresses and after-market play yard mattresses (typically around 3 inches in thickness prior to CPSC's crib mattress rule) demonstrates that increasing play yard mattress thickness from 1.5 inches to 3 inches, as proposed, is unlikely to adequately reduce the use of soft bedding materials in play yards.

6. Staff Assessment

Staff agrees with the petitioners that soft bedding is a serious concern for infant safety in play yards, and incident data have shown trends of caregivers using extra padding and soft bedding. However, staff does not recommend a rulemaking to modify the play yard rule to allow a thicker mattress as requested by the petitioners because the available evidence shows that increasing mattress thickness as proposed could potentially increase the risk of positional asphyxia.

Detailed above and in Tab F, staff has demonstrated that thicker mattresses may lead to increased risk of gap entrapment because mesh sidewalls deflect with force and can expand the gap between the mattress and sidewall. Staff found that especially with thicker mattresses, the sidewall deflection generally becomes greater due to the height of the force above the play yard floor where the mesh is most supported. This is further evidenced by the incident data where the majority of incidents involved after-market mattresses typically with thicknesses greater than 1.5 inches. As noted, a sidewall gap that forms a pocket larger than 1.5 inches in width and depth has the potential to entrap an infant resulting in positional asphyxia, and, therefore, considering gap expansion from flexible play yard sidewalls, requiring mattresses to be between 1.5 inches and 3 inches thick could increase the likelihood of hazardous gaps, resulting in suffocation. This entrapment risk is further exacerbated if increasing the softness of the mattress results in greater inward deflection of the mattress from the infant wedging in the sidewall gap. Thicker mattresses, if segmented, as is common practice for play yards, may result in larger segment gaps, increasing the risk of suffocation or other respiratory distress.

[39] The report, "Consumer Product Safety Commission (CPSC): Caregiver Perceptions and Reactions to Safety Messaging Final Report," with CPSC staff's statement, can be accessed using the following URL: https://www.cpsc.gov/content/Consumer-Product-Safety-Commission-Caregiver-Perceptions-and-Reactions-to-Safety-Messaging-Final-Report (or see CPSC.gov, "Other Technical Reports").

As discussed in Tab D, staff agrees with the petitioners that consumers too often perceive a play yard mattress as uncomfortably thin, and there have been numerous incidents involving infants being seriously and fatally injured due to added padding and soft bedding. Staff also agrees with the petitioners that warnings about these hazards are limited in effectiveness. However, pervasive use of added padding and soft bedding occurs with mattresses 3 inches and greater in thickness as well, and the use includes numerous purposes in addition to softening the floor of the sleep area, such as warmth and covering the mattress. The incident data and consumer research show that consumers commonly add padding and soft bedding to cribs as well, despite crib mattresses typically measuring 3 inches to 6 inches in thickness. Moreover, incident reports demonstrate use of soft bedding in play yards while using after-market mattresses, often supplementing the OEM mattresses, and, before the crib mattress rule became effective, after-market play yard mattresses were typically around 3 inches thick. Therefore, the incident data and consumer use data do not support the petitioners' hypothesis that increasing play yard mattress thickness requirements from 1.5 inches maximum to 3 inches maximum will meaningfully address the hazard patterns.

Staff is also concerned that increasing play yard mattress thickness would result in play yard - bassinet combination units being sold with two separate mattresses (one to meet the 1.5-inch maximum thickness requirement for the bassinet and one to take advantage of the proposed 3-inch thickness requirement mattress for the play yard). If a play yard comes with two mattresses, staff is concerned that some consumers may stack both mattresses in the play yard or bassinet. For models in which the play yard interior dimensions are the same or similar to the bassinet interior dimensions, this behavior would be more likely and concerning.

In addition, requiring a minimum thickness of 1.5 inches is unnecessary for providing a safe sleep environment, and it may introduce further concerns. The play yard rule (16 CFR part 1221) specifies that play yard mattresses shall be provided with play yards intended for sleep, and the mattresses must be 1.5 inches or less in thickness. While some consumers may perceive this limit of 1.5 inches as too low, this limit has contributed to a safe sleep environment for infants. The CPSC and other health organizations, such as the American Academy of Pediatrics (AAP),[40] recommend that infants should have a firm, flat, and level sleep surface.

As discussed in Tabs D and F, increasing the mattress thickness requirements such that mattresses must be between 1.5 inches and 3 inches thick would increase the potential for overly soft mattresses that could conform to an infant's face, unless an adequate firmness requirement is also devised. To address concerns for mattress deflection, particularly suffocation in an overly soft mattress, the crib mattress rule (16 CFR part 1241) requires a firmness test for after-market crib mattresses; however, currently there is no such test for OEM play yard mattresses. Staff's testing has shown that mattresses with up to 2 inches of filling material fail the crib mattress rule's firmness test, which is intended to prevent the hazard of positional asphyxia involving infants suffocating when face down in a soft mattress that can conform to an infant's face. The ASTM F15.66 subcommittee for crib mattresses is in the process of conducting further evaluation of firmness tests.

[40] American Academy of Pediatrics Updates Safe Sleep Recommendations: Back is Best: https://www.aap.org/en/news-room/news-releases/aap/2022/american-academy-of-pediatrics-updates-safe-sleep-recommendations-back-is-best/

Based on the above information, staff considers the petitioners' mattress thickness requests will reduce the safety of play yards.

B. Petition CP 22-2 – Standardized Size Petition

1. Petition Summary (Tab B)

Petition CP 22-2, titled *Petition to Standardize the Size of Play Yards and Play Yard Mattresses* (Standardized Size Petition), requests that the CPSC amend the mandatory rule for play yards to standardize the interior size of play yards and play yard mattresses. The petitioners assert that consumers perceive ambiguity in selecting appropriate mattresses for their play yards, resulting in consumers using ill-fitting mattresses and creating an unsafe environment that poses risks of entrapment and positional asphyxia in gaps between the mattress side and play yard sidewall.

The petitioners request that the Commission update 16 CFR part 1221 such that there are standardized sizes (horizontal, interior dimensions) for play yards and play yard mattresses, with one size for each perimeter shape. The petitioners explained that there are a variety of mattress sizes available in the market for a given perimeter shape, which leaves open the potential for consumers to select an ill-fitting mattress. The petitioners state that consumers should not have to measure or have uncertainty about the fit of the replacement mattress. Furthermore, the petitioners suggest that consumers may add soft bedding materials other than mattresses, such as blankets, quilts, and pillows to the sleep environment because they find it difficult to identify an appropriate replacement mattress.

2. Mattress Compatibility with Play Yards (Tabs D & F)

As discussed in Tab D, staff agrees with the petitioners that there has existed ambiguity for consumers selecting appropriate after-market mattresses for their play yards, and the requirements in applicable regulations should not rely solely on the consumer correctly measuring the products and identifying hazardous gaps. However, standardizing the horizontal dimensions of play yards and play mattresses could have the unintended effect of leading consumers to purchase unsafe after-market mattresses for their play yards because the safe use of play yard mattresses depends on more attributes than just their interior perimeter measurements (*e.g.,* attachment and structural characteristics as discussed subsequently here). Further, as explained below, effective since August 15, 2022, the crib mattress rule addresses petitioners' concerns about consumers choosing the correctly sized after-market play yard mattress while also ensuring compatibility to prevent other known hazards by requiring after-market play yard mattresses to meet certain performance requirements of OEM play yard mattresses.

As of August 15, 2022, in accordance with the crib mattress rule, all after-market play yard mattresses are required to meet the following sections of the mandatory play yard rule: Stability[41]; Cord/Strap Length[42]; Mattress[43]; Height of Sides[44]; Floor Strength[45]; Mattress Vertical

[41] Stability test to reduce the risk of play yards tipping over due to unlevel surface
[42] Maximum length of cords/straps attached to the mattress to reduce risk of strangulation
[43] Maximum mattress thickness requirement to reduce risk of positional asphyxiation from gap entrapment or overly soft sleep surface
[44] Minimum height requirement for sidewalls relative to the top surface of the mattress to reduce risk of fall injuries due to climb outs
[45] Strength test on the play yard floor to reduce risk of collapse

Displacement[46]. In addition to these sections, the crib mattress rule adds a mattress firmness requirement. The crib mattress rule also requires that after-market play yard mattresses must specify the brand(s) and model number(s) of the play yards in which the mattresses are intended to be used. This information must be visible when the product is in its retail packaging, and it must be included on-product and in instructional literature, in order to assist consumers in purchasing and using the correct after-market mattress for their play yard. Below describes two additional characteristics, mattress attachment and structural compatibility, that are addressed by the mattress vertical displacement and mattress firmness requirements of the crib mattress rule to eliminate or reduce these mattress-associated hazards.

Between January 1, 2010, and July 31, 2022, staff identified 42 incident reports[47] involving entrapment underneath a play yard mattress due to the mattress being moved and shifted, one of which resulted in a fatality. The most common reason the mattress was able to be displaced was because it was not properly secured down to the floor of the play yard. The play yard and crib mattress rules address this hazard scenario by requiring that mattresses be secured to the bottom of the play yard to prevent infants from maneuvering underneath the mattress and becoming entrapped. Play yards typically use straps attached to the bottom of the mattress that extend through a hole of the fabric play yard floor and attach to the rigid mattress support frame below. Products may vary based on different fastening mechanisms such as hook and loop, button snaps, buckles, etc. Also, the location of the straps often varies from product to product depending on the rigid frame structure of the particular play yard model.

Another aspect that varies between play yard models is the mattresses' structural characteristics. Products will vary with the size and location of regions of the play yard floor that are unsupported by rigid frame structure, and the mattress used with the play yard must meet specific structural needs to maintain a flat and safe sleep surface. Mattresses that are not structurally sufficient may sag between the rigid frame and form a suffocation hazard for small infants unable to extricate from a prone position. The crib mattress rule's firmness test addresses this type of hazard for after-market mattresses by ensuring that all surfaces with the sleep area are firm and flat. However, this firmness test only ensures a safe sleep surface for the play yard model for which an after-market mattress is intended and not universally across a standard size play yard.

3. Staff Assessment

Staff concludes that a 'one size fits all' mattress for standard size play yards may decrease safety. The crib mattress rule requires that all after-market play yard mattresses must be tested and certified with the play yards in which they are intended to be used, and each mattress must be labeled to identify the specific brand and model of play yard for which the mattress is intended to be used. This requirement assists consumers in selecting an appropriate after-market mattress for their play yard. Adding requirements to the rule to establish a standard size play yard may have an unintended consequence of consumer perception of a 'one size fits all' mattress that is safe to use for their play yard. Because of this perception, consumers may ignore labeling identifying the compatible brand and model play yard. As discussed above, this consumer behavior is potentially dangerous because play yards differ in meaningful ways beyond their interior horizontal dimensions, such as their structural integrity and means of securing the mattresses to the play yards. Therefore, staff considers the petitioners' requests

[46] Maximum vertical displacement requirement for mattresses to reduce risk of positional asphyxiation due to entrapment underneath the mattress
[47] Incident data detailed in Tab C

unnecessary and may have an unintended effect of reducing safety. Finally, as detailed below, staff assessed that a rule to standardize the sizes of play yards would impose substantial cost on the impacted industry and would reduce consumer choice.

IV. Market Analysis (Tab G)

About 2.5 million play yards are sold each year, to about two thirds of all families with newborns. At an estimated average retail price of $100, this is a $250 million per year market. Staff is unable to estimate with readily available information the number of after-market play yard mattresses sold each year. The petitioners did not provide specific data on the number of after-market play yard mattresses sold each year that they consider to be in scope of the petitions.

Prices for play yards range from under $50 to over $350. Play yards are sold in a wide variety of sizes and with diverse features to address different consumer uses for these products. As public commenters noted, these products can be used as play spaces, primary safe sleep spaces, and as sleep spaces for travel and other occasional use. Some are marketed for outdoor use. Many play yards have a bassinet attachment or bassinet mode. Other common attachments include toy bars, canopies, and diaper changing pads. Portability is an important and common feature; items throughout the price range fold for transport and/or have wheels. Some products are marketed only for play and do not come with any mattress. Play yards compete with other infant sleep products, including cribs, bassinets, cradles, and bedside sleepers; although none of those products are also designed for play. After-market mattresses range in price from about $30 to over $75 and are often marketed for use in the play yard as well as out of the play yard as activity mats, sleeping pads, or for use inside a floorless enclosure.

More than 100 firms supply play yards to the U.S. market, and a few dozen firms supply after-market play yard mattresses. The play yard market includes several large publicly traded companies based in the U.S. and Canada, as well as dozens of small U.S. manufacturers and importers, and foreign direct shippers. Most of the suppliers of both play yards and mattresses are small.

Based on preliminary market analysis, it appears that the actions proposed by the petitioners to standardize play yard sizes would impose substantial costs on the impacted industry, would reduce consumer choice, and could have a disparate negative impact on low-income consumers, at least in the short term.

Based on the petitioners' request regarding mattress thickness, any current play yard with an OEM mattress less than 1.5 inches thick, which the petitioners believe is common, would not be compliant. After-market mattresses similarly would not be compliant if they did not meet the requirement for minimum or maximum thickness. Thicker mattresses would almost certainly cost more to produce, package, and ship, as several public commenters noted, resulting in higher costs to suppliers that would have to be either absorbed (reducing profit) or passed onto consumers in the form of higher prices. All after-market mattresses that did not meet the requirements would have to be redesigned and third party tested or marketed only for use outside the play yard as an activity mat.

For the petition regarding standardizing sizes for both play yards and play yard mattresses, nearly every product currently on the market would not be compliant because there is currently a wide variety of sizes of rectangular play yards and play yard mattresses. The petition would

have CPSC specify only one allowed size for each perimeter shape (e.g., rectangle, square, oval). Any play yard that did not meet the standard size would have to be redesigned and third party tested or removed from the market.

Consumers would have a smaller set of more physically similar products to buy if sizes are standardized. Small, foldable play yards are usually the least expensive sleep product for a child up to 35 inches tall. The least expensive play yards currently sell for under $50, while the least expensive full-size cribs sell for about $120. Generally, thicker mattresses would mean that play yards would become more expensive and less portable. The reduction in consumer choice due to the standardized size requirement (meaning only one size of rectangular play yard or rectangular mattress would be allowed) could permanently reduce demand for play yards.

In the longer term, the market for play yards might adjust, as it did with full-size cribs, to offer a wide variety of prices and features within the standardized sizes requested by the petitioners. Regardless of how the market responds to the actions requested by petitioners, consumers would still be able to purchase other safe sleep products, including bassinets, cradles, cribs, and beside sleepers, and companies would still be able to make and sell play yards and play yard mattresses.

V. Public Comments

On May 19, 2022, CPSC published a notice in the *Federal Register* inviting public comments on the petition (87 FR 30436). The comment period ended on July 18, 2022. CPSC received four comments, all of which disagree with the petitioners' proposals. Below, staff provides a summary of the comments by topic and staff's response.

Comment 1

Three commenters (Graco Children's Products Inc. (Graco), Iron Mountains LLC., and Juvenile Products Manufacturers Association (JPMA)) stated that caregivers add extra items for comfort for both play yards and baby cribs. They referenced the DNPES study which shows that 75 percent of play yard users and 94 percent of baby crib users add soft bedding under their children in their respective products. The commenters asserted that this data show that increasing mattress thickness is unlikely to prevent consumers from adding soft bedding. Iron Mountains stated that the mandatory *Safety Standard for Crib Mattresses*, 16 CFR part 1241, requires play yard mattresses to be firm regardless of thickness, and therefore adding thickness will not change perception of comfort.

Response 1

Staff agrees with these commenters that the available evidence does not demonstrate that changing the play yard mattress thickness requirements such that mattresses must be between 1.5 inches and 3 inches thick, as proposed, will reduce the use of soft bedding in play yards. Based on incident data and consumer research, soft bedding is used in play yards for not only increasing cushioning but warmth as well and is also likely used to cover the mattresses similar to crib sheets. As cited by the commenters, it is common for caregivers to use soft bedding in cribs, which typically have mattresses measuring 3 inches to 6 inches in thickness, as well as with after-market play yard mattresses, which, prior to the crib mattress rule, typically measured around 3 inches. For more information, see Tab D.

Comment 2

All four commenters (Graco, Iron Mountains, JPMA, and Kids in Danger (KID)) expressed concern that increasing play yard mattress thickness may increase the risk of entrapment in a gap between the mattress and the sidewall. They commented that because play yards have flexible mesh sidewalls, elevating the sleep surface may reduce the safety of play yards because the mesh sidewalls are less supported higher above the floor of the play yard and an outward force can more easily expand the gap.

JPMA added that current evidence shows that flexible mesh sidewalls have not been an entrapment hazard with current OEM play yard mattresses and that incidents occur with play yards with thicker mattresses. JPMA also expressed concern that because some products feature bassinet modes that use the same mattress as on the floor of the play yard and bassinets are regulated by a different mandatory standard, 16 CFR 1218, this could force manufacturers to include two mattresses with their products and may lead to consumers using the wrong mattress for their bassinets or potentially stacking both mattresses in the play yard or bassinet. KID commented that they support allowing for thicker mattresses as long as there is a test with an outward force on the sidewall to measure any deflection that might increase the gap size. Lastly, Graco and JPMA commented that current mattresses up to 1.5 inches thick that are well-fitting have been used safely for sleeping over billions of uses.

Response 2

The CPSC and other health organizations, such as the AAP, recommend that infants should have a firm, flat, and level sleep surface. Staff assesses that increasing the mattress thickness requirements such that mattresses must be between 1.5 inches and 3 inches would increase the potential for overly soft mattresses that could conform to an infant's face, unless an adequate firmness requirement is also devised. Increasing play yard mattress thickness may increase the risk of entrapment in a gap between the mattress and sidewall. As staff demonstrated in testing various play yards and mattress heights with realistic weight applied horizontally against the play yard sidewalls, flexible play yard sidewalls tended to deflect more towards the center of the sidewalls, with greater deflection at 3 inches high than 1.5 inches in most cases. As discussed above, based on child development, a sidewall gap measuring greater than both 1.5 inches wide and deep is potentially hazardous due to risk of entrapment and positional asphyxia.

Increasing mattress thickness beyond 1.5 inches results in a depth greater than 1.5 inches, and deflection of the sidewall, such as from an occupant leaning against the sidewall, can extend a sidewall gap widthwise beyond 1.5 inches, forming a hazardous gap. In staff's testing, static gaps less than 0.5 inches expanded beyond 1.5 inches. For these reasons, staff has recommended to ASTM that sidewall gap testing must include representative horizontal forces on the sidewall (for more information, see Tab F).

Regarding the potential risk of the proposed requirements resulting in more combination bassinet-play yard units having two mattresses and consumers inappropriately using the mattresses (*e.g.,* stacking or using the wrong mattress for the wrong purpose), staff assesses that this is possible, but it is unclear to what extent this would occur. There are combination bassinet-play yard units that are sold with two mattresses, and staff has not identified a hazard pattern associated with both a bassinet and play yard mattress being provided. For models in

which the play yard interior dimensions are the same or similar to the bassinet interior dimensions, this behavior would be more foreseeable and concerning.

Comment 3

Two commenters (Graco and JPMA) expressed concern that there will be an increased risk of suffocation on the sleep surface due to the increased thickness. Both commenters stated that increasing the thickness of segmented mattresses will result in larger gaps between segments to accommodate the increased thickness and may lead to hazardous sleep surface angles in between segments. JPMA added that there are currently no requirements in the mandatory standard that would address this type of hazard. Additionally, both commenters opined that thicker, overly soft after-market mattresses increase the risk of suffocation because infants may sink into the mattress and form a "hammock," leading to an unsafe sleep surface angle that may result in positional asphyxiation. Graco demonstrated through testing that sleep surface angle may increase up to 17 degrees adjacent to an infant's head based on an after-market sample with a CAMI dummy weighing approximately 17 pounds placed on the center of the mattress. Lastly, KID commented that infants do not need a soft surface for sleep; rather, babies, and especially newborns, need a firm, flat surface for sleep.

Response 3

Staff agrees with the commenters that an overly soft mattresses is hazardous and may also create a suffocation hazard associated with "V" shape formed in segmented mattresses seams.[48] Although the crib mattress rule addresses the commenters' concerns by adding a mattress firmness requirement to ensure that all parts of an infant's sleep surface are firm and flat, the crib mattress rule only applies to after-market mattresses and does not apply to OEM play yard mattresses. The petitioners propose increasing the mattress thickness to decrease the likelihood of consumers adding soft bedding to the sleep environment, but staff considers that doing so may have an unintended effect of creating an overly soft sleep surface, thus decreasing the safety of the product, precisely what the petitioners offer the petition to prevent. Based on recommendations from the AAP, infants should have a firm, flat, and level sleep surface,[49] and staff's incident data review has shown that current mattresses less than 1.5 inches in thickness have afforded infants a safe sleep environment.

Comment 4

Three commenters (Graco, Iron Mountains, and JPMA) discussed multiple economic and environmental impacts that may result from the proposals of both petitions. The three commenters stated that thicker mattresses will increase shipping weight and shipping materials leading to increased emissions and shipping costs. Graco provided specific information on the expected increases in shipping and packaging costs if 3-inch-thick mattresses are used. Iron Mountains commented that thicker mattresses will increase the cost of play yards, making them less accessible to low-income consumers, and this may lead to consumers resorting to using products not intended for infant sleep. Furthermore, Iron Mountains commented that

[48] ASTM F2194-22e, Standard Consumer Safety Specification, section 6.8 Bassinets with Segmented Mattresses: Flatness Test requires the V shape formed by a folded or segmented mattress remain 10 degrees or less to address a suffocation hazard associated with segmented mattresses.
[49] American Academy of Pediatrics Updates Safe Sleep Recommendations: Back is Best: https://www.aap.org/en/news-room/news-releases/aap/2022/american-academy-of-pediatrics-updates-safe-sleep-recommendations-back-is-best/

standardizing the size of play yards may impact low-income consumers and non-profits that provide free play yards to families in need because it may remove many safe products from the market, leaving fewer options for consumers. JPMA estimated that it would take an estimated three to five years to completely re-design product lines. Lastly, Graco and JPMA commented that standardization will stifle innovation and reduce options in the competitive marketplace.

Response 4

Although staff does not currently have data to quantify the precise economic and environmental effects of the petitioners' proposed requirements, staff does agree with the commenters on the net negative economic effect. Staff is particularly concerned with the potentially disproportionate effect on lower-income families as this relates to the safety of the products. Staff acknowledges that lower-income families often rely on play yards for safe sleep solutions because of their lower cost relative to other sleep products, and staff agrees that increasing the mattress thickness requirements will almost certainly lead to increased cost of the product and thus make play yards less affordable. Staff does anticipate that suppliers will pass on the increased costs of production, shipping, and packaging to consumers, and that the requested actions of the petitioners would therefore raise retail prices for play yards. Staff also notes (see market analysis memo Tab G) that if only one size of play yard is allowed for each perimeter shape, the smallest size currently on the market for each shape, which tends to be the least expensive size, might not be the selected standard size.

Staff also agrees that standardization could reduce options in the marketplace, at least in the short run. However, it is also possible, as with the market for full-size cribs, that over time suppliers will find ways to offer innovative products within one standard size. As for time needed for redesign, it may take some time to redesign compliant products, given that the entire industry would need to redesign their products and packaging at the same time.

Comment 5

Two commenters (Graco and Iron Mountains) stated that the petitions will have multiple impacts on the utility of play yards. Graco argued that thicker mattresses will reduce the portability of play yards, which is a core feature of the product. They stated that play yards typically use segmented mattresses to wrap around the product when folded to protect the unit from damage during transport, and thicker mattresses will not be able to do this. Furthermore, Graco commented that families have different needs for play yards. They stated that because some families want compact play yards while others want larger play yards, standardizing the size of play yards will reduce the number of options for families based on their needs. Iron Mountains opined that eliminating the choice of size may force families who need play yards for travel and portability to result in using unsafe solutions for sleep such as couches, adult beds, nursing pillows, and portable bouncers/rockers.

Response 5

Staff is concerned with the effects of the petitioners' proposals on the utility and safety of play yards. Staff agrees that consumers typically rely on play yards because of their portability, especially for travel. Play yards are typically a convenient solution for safe sleep away from home, particularly when they can be folded into a compact size and are light weight, unlike traditional baby cribs. Standardizing the size of play yards may reduce the number of options for

consumers based on their size and weight needs for travel and may result in consumers using unsafe alternative sleep solutions.

Comment 6

Two commenters (Graco and KID) stated that standardizing the size of play yards does not ensure compatibility of after-market mattresses with play yards. They detailed different attributes that differ between play yards other than size, such as their attachment mechanisms for securing mattresses to the play yard floor to prevent shifting or lifting, floor supports underneath the mattress, and mattress structural integrity. They stated that the mandatory *Safety Standard for Crib Mattresses*, 16 CFR part 1241, already addresses compatibility concerns by requiring after-market play yard mattresses to list the specific brand(s) and model number(s) of the product(s) in which they are intended to be used.

Response 6

As discussed above and in Tabs D and F, staff agrees that play yards differ meaningfully in more ways than their dimensions. Staff discusses in detail how play yards vary from product to product in terms of how mattresses secure down to the floor of the play yard and their structural needs to support a safe and flat sleep surface based on the construction of the mattress floor supports. Staff agrees that the crib mattress rule contains requirements to ensure compatibility of all associated characteristics of play yards that contribute to their safe use.

Comment 7

Two commenters (Iron Mountains and KID) argued that the petition to standardize the size of play yards is not consistent with CPSC's practices of promulgating safety standards that set performance and/or labeling and instruction requirements. They stated that the petitioners' requests propose design standards rather than performance requirements. Iron Mountains argued that the proposal would impose a design standard on play yards because a separate product, supplemental mattresses, is hazardous.

Response 7

Staff agrees to the extent that requiring a potentially design-restrictive solution of a standardized play yard size is not justified by currently available data.

Comment 8

Two commenters (Graco and JPMA) note that not all play yards are required to be used with a mattress. The current play yard rule allows products that are intended exclusively for play and not for sleep to be used without a mattress and thus are not sold with a mattress; otherwise, play yards that are intended for sleep must be sold with a mattress. JPMA expressed concern that if mattresses were required for play yards that are designed only for play, that could imply that these products intended for play only are safe for sleep, which the commenter characterized as "problematic and dangerous.".

Response 8

The current play yard rule excludes products intended exclusively for play and not for sleep from being required to be sold with a mattress included. The petitioners' proposal does not

specifically request that a standard size play yard must include a mattress so the commenters' concerns may not be applicable..

Comment 9

Graco recommended potential enhancements to safety messaging to increase consumer awareness of hazards cited by the petitioners. They recommended CPSC establish an on-going consumer education campaign to reinforce proper use of infant sleep products. They also recommended increased use of iconography to increase the effectiveness of warning labels directing users to never add soft bedding to the sleep environment.

Response 9

Staff agrees that CPSC should continue consumer education efforts to reinforce the importance of using play yards safely, including guidance to never place padding, soft bedding, or supplemental mattresses under a sleeping infant, and to verify that the mattress is appropriate for the consumer's play yard. However, staff cautions that, while similar outreach efforts from CPSC and other consumer advocacy groups have played an important role,[50] such efforts have not been sufficient for convincing consumers to change potentially unsafe behaviors. As discussed above, research shows that consumers may disregard such warnings when compliance risks interfering with their infants' sleep or their perception of their infants' comfort. Enhanced iconography succeeding ANSI Z535.3 guidelines may also help to convey the hazard; however, as discussed in Tab D, warnings pertaining to these hazards have limited effectiveness.

VI. Commission Options

The Commission's regulations on petitions state that when considering whether to grant or deny a petition, the Commission considers:

(1) Whether the product that is the subject of the petition presents an unreasonable risk of injury;

(2) Whether a rule is reasonably necessary to eliminate or reduce the risk of injury;

(3) Whether failure to initiate rulemaking would expose the petitioner or others to the risk of injury the petitioner alleges the product presents; and

(4) If the petition seeks a ban, whether the product is being or will be distributed in commerce and whether a feasible consumer product safety standard would adequately protect the public from the risk of injury.

The petition regulations also state that when considering these factors, the Commission will consider the petition in relation to the agency's priorities, as stated in the CPSC's Policy on

[50] As discussed in ESHF staff's memorandum supporting the NPR for crib mattresses, numerous public awareness-raising campaigns have aimed to educate caregivers regarding the subject hazards, such as "Safe to Sleep" (formerly, "Back to Sleep," see https://safetosleep.nichd.nih.gov/activities/campaign), "ABC's of safe sleep" (see https://www.aappublications.org/news/2016/10/24/SIDS102416), and "Safe Sleep/Bare is Best" (see https://www.cpsc.gov/Safety-Education/Neighborhood-Safety-Network/Posters/Safe-Sleep-for-Babies).

Establishing Priorities and the Commission's resources available for rulemaking. 16 C.F.R. § 1051.9(a).

A. Petition CP 22-1 – Mattress Thickness Petition

1. Options

Options for Commission action to address the petition include:

A. Grant the Petition

The Commission may direct staff to develop an advance notice of proposed rulemaking (ANPR) or a notice of proposed rulemaking (NPR) under the authority of section 104 of the CPSIA to amend the play yard rule to require a minimum mattress thickness of 1.5 inches for play yards and increasing the maximum mattress thickness to 3 inches. Granting the petition, however, does not mean that the Commission would necessarily issue a rule in the specific form requested in the petition.

B. Deny the Petition

The Commission may deny the petition. The Commission also may deny the petition and direct additional action, such as directing staff to continue work on play yard mattress or soft bedding concerns within the context of the relevant voluntary standards.

C. Defer Decision on the Petition

The Commission could defer its decision and, for instance, direct staff to continue to work on the voluntary standards.

2. Staff Recommendation

For the reasons given in this briefing package, CPSC staff recommends that the Commission deny petition CP 22-1 on mattress thickness. Staff concludes that increasing the maximum mattress thickness as proposed by the petitioners may increase the risk of other hazards such as gap entrapment and suffocation in overly soft mattresses, and therefore may reduce the safety of play yards. Staff's review of the incident data also suggests that consumers are unlikely to adequately change behavior regarding adding soft bedding to play yard sleep environments, and thus the petitioners' proposals may not address the associated hazard. Lastly, based on staff's review of the incident data, play yard mattresses less than 1.5 inches in thickness have historically afforded a safe sleep environment for infants, and it aligns with recommendations from the American Academy of Pediatrics in that infants should have a firm, flat, and level sleep surface; therefore, staff does not recommend establishing a minimum play yard mattress thickness of 1.5 inches with an allowed thickness of up to 3 inches. Because the current play yard rule has resulted in play yards providing safe sleep accommodations, staff considers the proposed amendments to increase mattress thickness as not reasonably necessary to reduce the risk of injury.

B. Petition CP 22-2 – Standardized Size Petition

1. Options

Options for Commission action to address the petition include:

A. Grant the Petition

The Commission may grant the petition. The Commission may direct staff to develop an advance notice of proposed rulemaking (ANPR) or a notice of proposed rulemaking (NPR) under the authority of the section 104 of the CPSIA to amend the play yard to standardize the interior size of play yards and play yard mattresses. Granting the petition, however, does not mean that the Commission would necessarily issue a rule in the specific form requested in the petition.

B. Deny the Petition

The Commission may deny the petition. The Commission also may deny the petition and direct staff to continue work on play yard mattress concerns within the context of the relevant voluntary standards.

C. Defer Decision on the Petition

The Commission could defer its decision and direct staff to continue to work on voluntary standards to address ill-fitting after-market mattresses being used in play yards.

2. Staff Recommendation

CPSC staff recommends that the Commission deny petition CP 22-2 on standardizing play yard sizes. As explained in this briefing package, play yard mattresses differ in characteristics beyond their interior perimeter dimensions. The crib mattress regulation is intended to address the compatibility of after-market play yard mattresses and play yards in a more complete manner, including identification of suitable play yard mattresses, mechanisms to secure the mattress to the play yard floor, and structural integrity requirements to ensure a flat, firm, and safe sleep surface. Furthermore, there are insufficient data to justify specific play yard dimensions based on safety. Because the crib mattress rule addresses the hazards cited by the petitioners, staff considers the proposed amendments to standardize the size of play yards as not reasonably necessary because the crib mattress rule adequately addresses the risk of injury cited by the petitioners.

Tab A: Petition to Require Minimum Thickness for Play Yard Mattresses

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PETITIONERS

November 29, 2021

Re: Petition to Require Minimum Thickness for Play Yard Mattresses

Petitioners, Carol Pollack-Nelson, Ph.D., Alan H. Schoem, Esq. and Sarah Newens, M.S. (hereinafter "Petitioners"), pursuant to 16 C.F.R. § 1051 Procedure for Petitioning for Rulemaking, request that the U.S. Consumer Product Safety Commission initiate mandatory rulemaking to require a minimum thickness for play yard mattresses. The current standard for play yard mattresses requires a maximum thickness of 1.5" including ½" plywood. With only a maximum thickness specified, some manufacturers provide mattresses thinner than the 1.5" allowance, in some cases with only ½" of filler over the plywood floor.

Fatalities in play yards typically occur when consumers add cushioning (i.e., pillows, cushions, foam, etc.) under a baby in the play yard due to the perception that the play yard floor is too hard and inadequately cushioned. Consumer research conducted by the CPSC found consumers perceive the play yard floor to be too hard and as a result, they add soft bedding under the baby in a play yard (Durable Nursery Product Exposure Survey (DNPES), Westat, 2014; Caregiver Perceptions & Reactions to Product Safety Messages, Fohrs Marsh, 2019).

Background & Data

In the petition, CP-15, petitioner Joyce Davis relayed her family's tragic experience with the death of her 4-month-old son, Garret, in a portable crib with an inadequately sized supplemental mattress. "We were totally unaware of the risk of danger we exposed our son to. We used the supplemental mattress in the play yard because it looked more comfortable than the original mattress; we had done it before with our other children and knew many other parents that had done the same."

Mrs. Davis's effort to make the portable crib more comfortable for her son by using a different mattress than the one provided with the play yard is not uncommon. Incident data has long demonstrated that consumers add soft materials to a play yards and other infant sleep environments for added comfort for their baby. This was discussed in the Staff Briefing Package in response to Petition CP 15-2: "Newens and Balci-Sinha (2017) explain that to make infant sleep environments more comfortable, caregivers commonly use soft bedding and after-market mattresses, instead of, or in addition to, the original

equipment manufacturer (OEM) mattress." (NPR, 2020, p. 89). The data demonstrate this to be a problem in various sleep environments, including play yards (Newens and Sinha, p. 48).

> In reviewing the large set of play yard-related, positional asphyxia incidents to identify those associated with aftermarket mattresses, ESHF staff noted incidents involving infants ranging from 1 to 10 months old that did not involve an aftermarket mattress, but did involve the addition of a mattress-like product, such as foam, pillows, and sofa cushions. In addition, in the online product reviews for aftermarket mattresses that were included with the petition, caregivers expressed concern for infants sleeping on hard surfaces. ESHF staff concluded that extra bedding is used as a way to increase perceived comfort for the infant.

In the more recent analysis of play yard fatalities for the NPR, Harsanyi reached a similar conclusion. His analysis found soft bedding was added to the sleep area in 41 (about 35%) of the deaths. "Where reasons were provided, caregivers typically explained that they used soft bedding to add comfort and warmth" (Harsanyi, 2020, p. 92).

> Where reasons were provided, caregivers typically explained that they used soft bedding to add comfort and warmth. Regarding items added for comfort, staff found that caregivers used an after-market mattress (typically 3" or greater) in 16 of the 26 cases involving play yards or non-full-size cribs. In at least 6 of these 16 cases, caregivers used the after-market mattress on top of the OEM mattress, including at least three cases involving full-size crib mattresses used to supplement another mattress in a play yard.

The perception that mattresses are too thin relates to performance requirements for play yard mattresses. The ASTM crib mattress standard, ASTM F2933, requires play yard mattresses to have a *maximum thickness* of 1.5" inches, including up to 1" of filler. However, as we have learned through participation in the ASTM subcommittee, manufacturers typically use less than 1" of filler in order to ensure their products are in compliance. Thus, in actuality, play yards often have ¾" filler or less.

Two studies have been conducted at the request of the CPSC to learn about consumer use of play yards and their perceptions and motivations relating to such use.

A. CPSC Durable Nursery Product Exposure Survey (DNPES) - 2013

Staff's conclusion that consumers add bedding material to play yards because of the belief that the OEM mattress is too hard and uncomfortable is supported by CPSC's Durable Nursery Product Exposure Survey (DNPES). This national probability sample was conducted in 2013 of U.S. households with children 5 years of age and younger (Durable Nursery Products Exposure Survey (DNPES): Final Summary Report, 2014; referenced in the Staff Briefing Package, May 10, 2017, p. 5). Survey participants were asked about items added to sleep products under the child. Researchers, found "[a]pproximately 75 percent of play yard users reported placing an item (other than the intended mattress) under the child in a play yard. Items added to play yards included pillows (~26%), blankets or quilts (~62%), and mattress pads (~12%). These findings suggest that consumers commonly add

items to cribs, play yards, and non-full-size cribs for comfort, including soft bedding material" (Harsanyi, 2020, pp. 93-94).

B. Fohrs Marsh Group Focus Groups – May 2019

In May 2019, Fohrs Marsh Group conducted focus group research to learn about consumers' safe sleep practices involving various infant sleep products, including cribs and play yards. Six in-person focus groups were convened in Baltimore, Maryland, with parents and grandparents of infants ages 2 through 11 months. Participants reported that where and how they place the baby to sleep is often influenced by what is convenient and what is comfortable for their baby. For example, several participants were aware of SIDS, the Alone, Baby on their Back, Crib (ABCs) safe sleep strategy, and the safety in not having any additional items in the sleep environment; however, they still reported adding items to the sleep environment to make the environment more comfortable for their infant—defining comfort by whether the infant sleeps all night or not (p. 16).

> Overall, parents and grandparents reported that they perceive the bassinet, playard, and crib to have hard surfaces that are not comfortable for their infant. A parent noted purchasing a memory foam mattress for their infant in order to make the sleep environment more comfortable and to provide their infant with a better sleep experience. Laying a blanket down or purchasing a comfortable mattress for the bassinet or the playard were also commonly reported additions to the sleep environment to make it more comfortable.
>
> The majority of grandparents reported adding products they perceive as comfortable to their infant's sleep environment Some grandparents recounted that they add pillows and blankets to the sleep environments when the infant is sleeping, noting the items add comfort and warmth. (Fohrs Marsh, 2019, p. 17).

The inconsistency between participants' understanding of the safest way to place a baby to sleep and actual safe sleep practices aligns with previously published research findings.

> Kennedy et al. (2017) completed interviews and focus groups to further understand the obstacles that caregivers face when adopting AAP recommendations, and found that caregivers do have a general awareness of sleep safety best practices. However, there is still a gap between knowledge and behaviors: non-compliance still occurs, and caregivers remain resistant to follow recommendations (Ahlers-Schmidt, Schunn, Dempsey, & Blackmon, 2014).

When soft bedding (e.g., blankets and pillows) is added to an infants' sleep space, it presents a risk of suffocation, particularly if the baby is placed to sleep on their side or prone or if they roll to prone position and are too young to clear their nose and mouth. When sofa cushions, pillows, and ill-fitting mattresses are added to a sleep environment, there is the additional risk of suffocation due to gap entrapment. To mitigate these risks, warnings on play yards advise consumers not to add soft bedding and to only replace the mattress pad that came with the play yard with a mattress of the same dimensions. Yet warnings are often overlooked, particularly on products for which use is intuitive.

Focus group participants in the Forhs Marsh study were shown a warning label (see Figure 1 below) similar to one commonly found on a common infant sleep product (Fohrs Marsh, 2019, pp. 23-24). "Nearly all participants indicated that they were aware of the warning label presented in the activity" (Fohrs Marsh, 2019, p. 24). While many participants reported reading a warning label when they see it, others mentioned that they skim or skip the warnings, noting that they are "all the same" or for liability purposes. "Therefore, they tend to gloss over the labels and do not necessarily internalize them" (p. 25).

Figure 1. Warning label

Petitioners' Request

To reduce the perception by consumers that the play yard floor is too hard and soft bedding should be added, we are petitioning to require *a minimum play yard mattress thickness of 1.5 inches* with a minimal tolerance allowed; this depth is presently the maximum thickness allowed by the play yard standard. As discussed above, to ensure they do not exceed this thickness, some manufacturer's mattresses currently on the market are actually thinner than what is permitted perhaps because there is no tolerance allowed. In addition to a minimum thickness of 1.5 inches, we recommend a maximum space allowance of 0.5 inches between the side of the mattress and the mesh side of the play yard. A maximum gap size of 0.5 inches will effectively prevent entrapment between the mattress and the mesh. Further, a 0.5-inch maximum gap size is consistent with the maximum gap proposed by the ASTM Task Group on Play Yard Fit and Thickness. revision to the standard.

This petition also requests the Commission establish a maximum play yard mattress thickness of 3 inches. This is based on the CPSC's data and analysis of that data over a 17-year period. CPSC Staff undertook a review of play yard fatalities reported from Jan 1 2000 to Dec 31, 2016. In that time, there were six cases of head entrapment in an aftermarket mattress that was too small for the play yard, leaving a gap ranging from 2 to 7 inches between the side of the mattress and the play yard wall. The Staff Briefing Package did not identify any entrapment incidents involving well-fitted mattresses (i.e., with gaps of 1 inch or less).

Mattresses measuring 2 to 3 inches thick that properly fits a play yard (i.e., with a gap between the side of the mattress and the mesh side of the play yard no greater than 1 inch) can, and has been, safely used in play yards. Over the last decade, millions of supplemental mattresses with a thickness of 2 to 3 inches have been sold and safely used on play yards. At the same time, we know that thinner mattresses have been associated with deaths due to the addition of soft bedding under the baby as a result of consumers' perceptions that the thin, hard mattress is not comfortable for their baby.

ASTM F406 – 19 seeks to make play yards safer. However, keeping the 1.5" maximum thickness in this standard does not make the product safe and is not effective in protecting infants. As long as consumers perceive play yard mattresses to be too thin and uncomfortable for their infant, they will continue to add soft bedding (e.g., another mattress, pillow, blankets) underneath their baby. No warning can overcome this perception. Rather, the hazard pattern can and should be addressed by a performance requirement that increases the minimum thickness for play yard mattresses to 1.5 inches with a small tolerance added, e.g., ¼ inch or such other tolerance as the Commission determines to be appropriate, so that manufacturers will have flexibility to meet the minimum thickness requirement.

Deaths in play yards can be prevented, but only if changes are made to the standard. With decades of data, we know what presents a hazard and what does not. The time is long overdue for standards to catch up with the data.

Respectfully submitted,

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Tab B: Petition to Standardize the Size of Play Yards and Play Yard Mattresses

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PETITIONERS

November 29, 2021

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Re: Petition to Standardize the Size of Play Yards and Play Yard Mattresses

Petitioners, Carol Pollack-Nelson, Ph.D., Alan H. Schoem, Esq., and Sarah Newens, M.S. (hereinafter "Petitioners"), pursuant to 16 C.F.R. § 1051 Procedure for Petitioning for Rulemaking, request that the U.S. Consumer Product Safety Commission initiate mandatory rulemaking to standardize the size of play yards and play yard mattresses. The variety of play yard mattresses in the market can, and have, resulted in consumers placing an inappropriately sized mattress into a play yard, resulting in fatality. When a play yard mattress is too small for the play yard and leaves a gap 2 inches or greater, an infant can roll into and become entrapped in this space which can result in suffocation.

Background & Data

On June 16, 2015, the president of Keeping Babies Safe (KBS) petitioned the CPSC, requesting a ban on supplemental mattresses for play yards with non-rigid sides (petition CP 15-2: Petition Requesting Rulemaking on Supplemental Mattresses for Play Yards with Non-Rigid Sides). In the petition, CP-15, the petitioner relayed her family's tragic experience with the death of her 4-month-old son, Garret, in a portable crib with an inadequately sized supplemental mattress. The petitioner stated "We were totally unaware of the risk of danger we exposed our son to. We used the supplemental mattress in the play yard because it looked more comfortable than the original mattress; we had done it before with our other children and knew many other parents that had done the same."

In response to this petition, CPSC Staff reviewed play yard fatalities reported from Jan 1, 2000, to Dec 31, 2016. In the 17-year period studied, they identified 12 reported fatal incidents that likely involved the use of an aftermarket mattress in a non-rigid-sided play yard. CPSC's Health Sciences staff determined that seven of the 12 incidents were entrapments that likely involved use of an aftermarket mattress in a non-rigid-sided play yard; i.e., mesh or fabric-sided play yards. In these seven incidents, the aftermarket mattress was too small for the play yard. "For those 7 incidents associated with a poor fitting mattress, the size of the space between the edge of the mattress and the play yard side varied in width from 2 to 7 inches" (Nakamura, 2017, p. 53).

As the staff recognized in its briefing package transmitted to the Commission September 22, 2021, recommending a final crib mattress rule, the data on play yard fatalities from Jan 2000 through Dec 2016 does not support a ban of all supplemental mattresses. Rather, the data supports a ban of ill-fitting mattresses that create a gap between the side of the mattress and the play yard wall in which the baby's head/face can become entrapped. The Staff Briefing Package did not identify any entrapment incidents involving well-fitted mattresses (i.e., those with gaps of 2 inches or less[1]).

In addition to incident data, the CPSC also has information about how and why consumers use play yards as they do with regard to adding an aftermarket mattress and soft bedding. One source of data is online reviews of after-market mattresses for play yards. In online reviews, caregivers express concern for infants sleeping on the hard OEM play yard mattress. Their perception that the play yard mattress is hard is likely due to existing requirements for play yard mattresses. The ASTM standard requires play yard mattresses to have a *maximum thickness* of 1.5" inches, including up to 1" of filler. However, as we have learned through participation in the ASTM subcommittee, manufacturers typically use less than 1" of filler in order to ensure their products are in compliance. Thus, in actuality, play yards often have ¾" filler or less.

This explains why parents and caregivers think the play yard floor is so hard and why they seek to add additional cushioning. To make the hard mattress/floor in the play yard more comfortable, some consumers seek out an after-market mattress that is thicker than the original equipment provided by the manufacturer. After-market mattresses are typically between 2" to 4" thick. As previously discussed, in 17 years of fatality data, there are no cases of fatality involving a <u>well-fit</u> after-market mattress.

Ensuring that mattresses fit the play yard is key to their safety. Consumers should not have to measure or have uncertainty about the fit of the replacement mattress. However, if there are a variety of mattress sizes available in the market for a given perimeter shape, consumers may inadvertently purchase the wrong size. This poses a potential entrapment danger.

In addition, if it is difficult for consumers to figure out the appropriate size mattress for their play yard, they may instead opt to place folded blankets, quilts, or pillows under their baby. In fact, two studies commissioned by the CPSC found the majority of study participants add blankets, quilts and pillows under their baby in the play yard in an effort to soften the hard surfaces.[2]

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[1] There is one incident mentioned in the CPSC data that involves a play yard with a 1" gap between the mattress and the side of the play yard. However, it is our understanding that in that case, the IDI does not mention entrapment. Rather, it indicates that the infant was lying face down and states that the infant's face was found against the mesh side; not in the gap.

[2] 2014 Durable Nursery Product Exposure Survey (DNPES); 2020 Fohrs Marsh Study of Caregiver Perceptions and Reactions to Product Safety Messages.

Clearly the current requirement for play yard mattresses to be thin and with little filler is inducing consumers to add soft bedding or seek out an after-market replacement mattress. Even if the Commission issues a final rule allowing aftermarket mattresses to be 1.5 inches or thicker, with so many different dimensions of play yards and mattresses, there still is a risk that consumers inadvertently will use the wrong size mattress in their play yard. To make this process easier and safer, we are petitioning the Commission to issue a mandatory standard standardizing the sizes of play yards to one size per perimeter shape, i.e., one size for square play yards, one size for rectangular play yards, one size for oval play yards and one size for round play yards.

A Precedent for Standardizing Infant Sleep Spaces - Standardization of Crib Mattresses

A precedent for standardizing infant sleep spaces into one size was established in the original Requirements for Full-Size Baby Cribs published in the Federal Register of November 21, 1973, 38 Fed. Reg. 32,129. In that regulation, when asked by a commenter to specify only "maximum values for the interior dimensions [of cribs]" the Commission rejected that comment concluding that

> setting minimum interior dimensions is necessary to provide uniformity of size for consumers who must purchase accessories, including properly fitting mattresses, which contribute to the crib's safety aspects.

38 Fed. Reg. 32,129 (November 21, 1973).

Accordingly, the Commission established one interior dimension for full-size baby cribs at 16 CFR § 1508.3(a), now 16 CFR § 1219.(c)(iii).

The identical rationale applies to play yards.

Deaths in play yards can be prevented if the Commission changes the play yard standard to require a uniform interior dimension as it did in 1973 for full-size cribs.

Petitioners' Request

To mitigate the risk posed by an undersized mattress in a play yard, we are petitioning the Commission to initiate rulemaking to standardize the size of play yards and play yard mattresses to one size for each given perimeter shape. Such standardization would necessitate play yard mattresses being sized appropriately to fit a standardized play yard with a maximum gap of 1/2-inch (or such other dimension the Commission determines to be appropriate).

Standardizing the size of play yards and their mattresses would allow consumers to purchase properly fitting after-market mattresses without requiring them to precisely measure the interior dimensions of their play yard. This action should greatly reduce or eliminate the risk of suffocation incidents due to entrapment in an ill-fitting mattress. It also should mitigate the need for consumers to add cushions, pillows, soft bedding and the like to overcome the perceived discomfort of the mattress pad currently supplied with play yards.

Respectfully submitted,

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Tab C: Reported Fatal and Nonfatal Incidents Involving Fit Issues with Mattress Products Used in Play Yard

United States
Consumer Product Safety Commission

Memorandum

TO: Frederick DeGrano, Project Manager
Division of Mechanical Engineering,
Directorate for Engineering Sciences

DATE: March 29, 2023

THROUGH: Stephen Hanway, Associate Executive Director
Directorate for Epidemiology

Risana Chowdhury, Division Director
Directorate for Epidemiology,
Division of Hazard Analysis

FROM: Adam Suchy, Mathematical Statistician
Directorate for Epidemiology,
Division of Hazard Analysis

SUBJECT: Reported Fatal and Nonfatal Incidents Involving Fit Issues with Mattress Products Used in Play Yards

Introduction

Petition CP 22-1 requests that the Consumer Product Safety Commission (CPSC) amend the mandatory rule for play yards, 16 CFR part 1221, to require a minimum mattress thickness of 1.5 inches, and a maximum mattress thickness of three inches. Petition CP 22-2 requests CPSC to amend the play yard standard to standardize the size of play yards and play yard mattresses to one size for each given perimeter shape. Below, staff provides an analysis of incident data related to play yard mattress fit issues reported to the CPSC between January 1, 2010 and July 31, 2022.

Incident Data[51]

A play yard is defined by the mandatory rule for play yards (16 CFR part 1221)[52] as:

> *a framed enclosure that includes a floor and has mesh or fabric sided panels primarily intended to provide a play or sleeping environment for children. It may fold for storage or travel..*

In this memorandum, products that are referred to as "mattress products" are original equipment manufacturer (OEM) play yard mattresses (i.e., mattresses included with play yards), after-

[51] Incidents presented in this memorandum represent a minimum for the number of incidents that have occurred during the given timeframe.
[52] The play yard product is defined in ASTM F406-19 and can be purchased at: Standard Consumer Safety Specification for Non-Full-Size Baby Cribs/Play Yards (astm.org).

market play yard and crib mattresses, and mattress cover products (*i.e*., fitted sheets, mattress covers, protectors, and toppers). Foam padding, homemade or makeshift mattresses, nursing pillows, sleep positioner products, and other bedding and pillow products are not considered "mattress products" for the purposes of this analysis.

Staff of CPSC's Directorate for Epidemiology, Division of Hazard Analysis (EPHA), searched the Consumer Product Safety Risk Management System[53] (CPSRMS) and the National Electronic Injury Surveillance System (NEISS) for incidents of mattress fit issues in play yards reported to have occurred between January 1, 2010 and July 31, 2022. Staff conducted two searches: one involved seven product codes with no other restrictions on the extraction criteria,[54] and the other involved one product code along with certain keywords in either the manufacturer/model or narrative fields.[55]

To identify mattress fit issues, staff reviewed each incident to ascertain if there was a mention of a gap present or a wedging/entrapment between a mattress and an end/sidewall of a play yard; a mattress moved or shifted in some way allowing contact or entrapment between the mattress and the fabric bottom of the play yard; or a fitted sheet or mattress cover, protector, or topper caused a mattress to bend, buckle, fold up, or create a gap between the mattress and an end/sidewall of the play yard. Staff identified 24 fatal incidents and 61 nonfatal incidents with one of these mattress fit issues, which also included seven nonfatal injuries. Among the injuries, one required hospitalization.

Staff did not limit the victim's age range in the data extracted. However, among all the reported fatalities, the oldest child was 11 months old. Among the 61 nonfatal incidents, the age of the child was known in 34 of the incidents. Among those 34 nonfatal incidents, only four children were older than 13 months: two were 15 months old, one was 16 months old, and one was 21 months old.

Table 1 summarizes the number of reported fatalities and nonfatal incidents involving fit issues of mattress products that were being used in a play yard by hazard category, reported to have occurred between January 1, 2010 and July 31, 2022. The NEISS contained only one reported nonfatal injury case. Incidents in the "Wedging/Entrapment or Gap Present" category are the incidents associated with the hazards cited by the petitioners, such as gap entrapments, while incidents in the other two categories, "Mattress Shifted" and "Fitted Sheet or Mattress Cover", have other contributing factors that lead to similar hazards, such as gaps created by interactions between a child and the mattress.

[53] CPSRMS is the epidemiological database which houses all anecdotal reports of incidents received by CPSC, death certificates purchased by CPSC, and in-depth investigations of these anecdotal reports. Examples of documents in CPSRMS are: hotline reports, internet reports, news reports, medical examiner's reports, death certificates, retailer/manufacturer reports, and documents sent by state/local authorities, among others.
[54] Staff searched seven product codes: playpens and play yards (1513), portable cribs (1529), bassinets or cradles (1537), baby mattresses or pads (1542), cribs, nonportable (1543), cribs, not specified (1545), and cribs, nonportable or not specified (1552). No additional filters were applied to this search.
[55] Staff searched data for an additional product code, 9101, which captures the incidents where the product codes were not specifically identifiable. Staff applied a second layer of screening for these reports: if incidents included at least one of the following keywords: "play", "crib", "p la", "pl a", "pnp", "baby pen", "pack n", "pack and p", "packn", "matt", and "pad" in either the manufacturer/model or narrative fields, the report was included for review.

Table 1. Reported Fatal and Nonfatal Incidents Related to Fit Issues Involving a Mattress Product Being Used in a Play Yard: January 1, 2010–July 31, 2022

Play Yard Mattress Issues	Number of Reported Fatalities	Number of Reported Nonfatal Incidents
Wedging/Entrapment or Gap Present Between Mattress and an End/Sidewall of Play Yard	**21**	**14**
OEM Play Yard Mattress	*2*	9
After-Market Mattress	*13*	5
Unknown or Vague Description of the Mattress	*6*	0
Mattress Shifted Allowing Contact or Entrapment with the Fabric Bottom of the Play Yard	***3***	**39**
Child moved the mattress up and had at least some body part trapped under the mattress	*3*	*30*
Mattress will not lay flat	*0*	*9*
Fitted Sheet or Mattress Cover/Protector/Topper Issue	**0**	**8**
Total Incidents Reported	**24**	**61**

Source: CPSRMS and NEISS databases.
Reporting is ongoing for CPSRMS; the years 2020–2022 are considered incomplete.

Among the 21 wedging/entrapment deaths, one child was 11 months old, and the other 20 children were between the ages of one and eight months old. Among the 3 deaths where the mattress was shifted, the children were between the ages of 6 and 11 months old. A detailed account of each of the 24 reported deaths can be found in the Appendix of this tab.

Among the 61 nonfatal incidents, there were 7 injuries reported, including: one hospitalization, one child seen by a medical professional, and five injuries to children with the level of care not known. Among the reported nonfatal incidents, some reports did not involve any actual incident while a child was present in the play yard environment; others reported the presence of a mattress fit issue while a child was in the play yard but was not injured. Although these incidents did not report an injury, a child placed in a play yard environment with a mattress fit issue could potentially suffer an injury or death. Staff summarizes in the following sections the hazard patterns for the fatal and nonfatal incidents from Table 1.

Wedging/Entrapment or Gap Present Between Mattress and an End/Sidewall of Play Yard

This hazard category is divided into subcategories based on the type of mattress being used: OEM mattress, after-market mattress, and unknown whether the mattress was the OEM or an after-market mattress.

In the 21 wedging/entrapment deaths, an infant was found wedged in a gap between a mattress and an end/sidewall of the play yard, where the mattress was undersized for the play yard. Among the 21 wedging/entrapment deaths, two deaths involved an OEM play yard mattress, 13 deaths involved after-market mattresses, and six incidents involved an unknown mattress type.

Twenty-three percent (14 out of 61) of the nonfatal incidents reported either a gap was present or a wedging/entrapment of at least some body part between a mattress and an end/sidewall of

the play yard. Three incidents reported actual entrapment incidents; the rest of the incidents reported that the mattress was discontinued from use after a gap was discovered between a mattress and an end/sidewall of the play yard.

Among these 14 reports, eight involved an OEM mattress that was too small, resulting in three head entrapments, and five reports of gaps with no entrapment; one involved an OEM mattress that shrunk and created a gap; four involved an after-market mattress that was too small; and one involved an after-market mattress that shrunk.

Among the 14 reports, there was one injury reported: a head entrapment between an OEM mattress and an end mesh wall of the play yard, which resulted in red marks and an imprint of the mesh lining on the face of the child. While the child was seen by a medical professional, the child was not seriously hurt.

Mattress Shifted Allowing Contact or Entrapment with the Fabric Bottom of the Play Yard

This hazard category is divided into two subcategories of entrapment: due to the mattress moving or shifting in some way and due to the mattress not lying flat.

The three deaths involved children who managed to lift up an OEM mattress and became entrapped between the mattress and the bottom mesh of the play yard. All three incidents involved the OEM play yard mattress.

Among the 39 nonfatal reports in this category, one report involved an after-market play yard mattress, and the other 38 reports did not provide enough information to determine the type of mattress.

Forty-nine percent (30 out of 61) of the reported nonfatal incidents involved a child who shifted a play yard mattress in some way and had at least some body part entrapped between the mattress and the bottom surface of the play yard. Usually, a child was able to pull or fold the mattress up, creating gaps where the child could become entrapped.

Among the 30 incidents, 17 involved a child crawling under the mattress; four involved head entrapments beneath the mattress; three involved a child getting partially entrapped/wedged in an unspecified way beneath the mattress; three involved arms or hands entrapped; two involved legs or feet entrapped; and one involved a child lifting up the mattress and was found with a swollen eye.

Among the 30 incidents, seven involved an injury: one required hospital admission due to a femur fracture after a leg became entrapped; one child was seen by a medical professional after found with a swollen eye after pulling up the mattress; and five injuries (a red mark on the neck, a minor bruise to the forehead, a strained forearm, a pinched hand, and an unspecified injury) were not treated by any medical professional.

Among the 30 infants, seventeen were 6 months old or younger; seven were between 7 and 12 months old; three were between 13 and 18 months old; one was 21 months old; and two were children with unknown ages.

Among the 30 incidents, twenty-one occurred before 2014, four occurred between 2014 and 2016, and five occurred on or after January 1, 2017.

Fifteen percent (9 out of 61) of the nonfatal incidents reported that the OEM mattress would not lay flat, and the consumers discontinued its use; no children were involved in any of these incidents. Among the nine incidents, four occurred between the years 2010 and 2013, none occurred between 2014 and 2018, and five occurred on or after January 1, 2019.

Fitted Sheet or Mattress Cover/Protector/Topper Issue

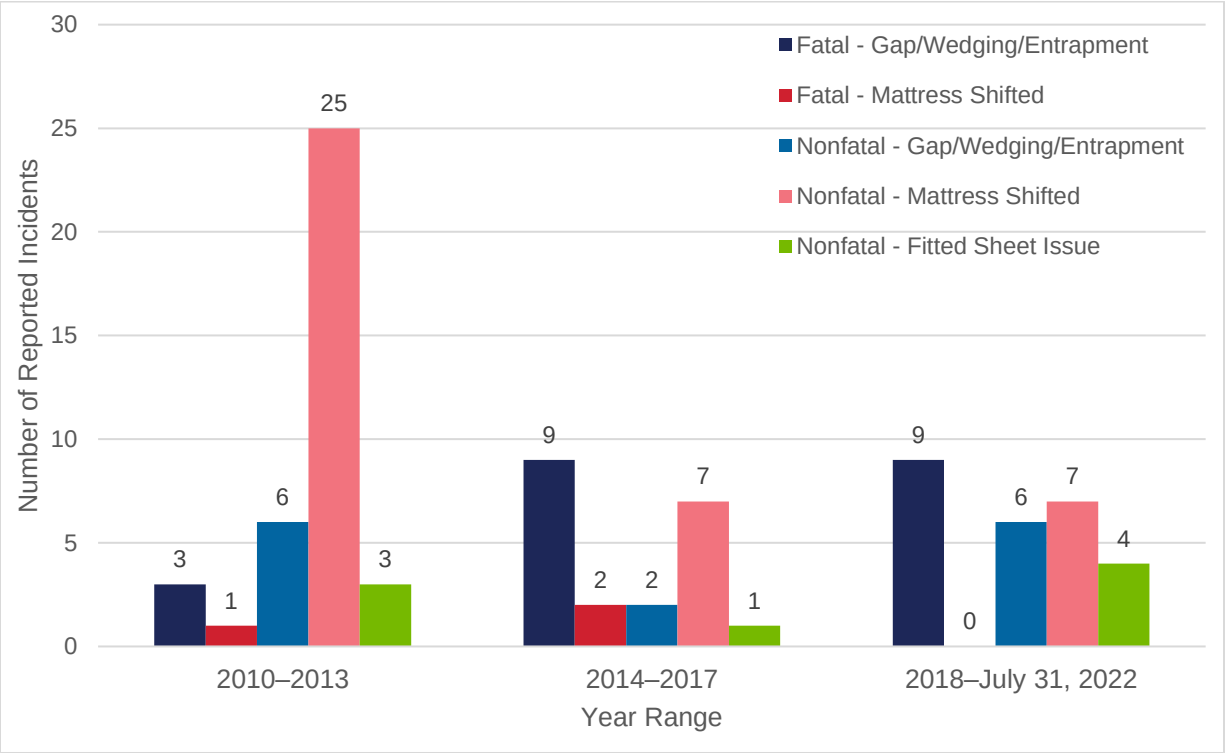
Thirteen percent (8 out of 61) of the reported nonfatal incidents involved a fitted sheet, mattress cover, protector, or topper which caused a mattress to bend, buckle, fold up, or create a gap in some other way between the mattress and an end/sidewall of the play yard. No children were involved in any of these incidents because the fitted sheet or mattress cover product was discontinued from being used after discovering the sheet or cover did not fit the mattress properly. Among the eight incidents, four occurred between the years 2010 and 2014, none occurred between 2015 and 2018, and four occurred on or after January 1, 2019.

Figure 1 summarizes the number of reported fatalities and nonfatal incidents involving fit issues of mattress products that were being used in a play yard by hazard category and year range, reported to have occurred between January 1, 2010 and July 31, 2022. Note that CPSC established a final rule on safety standards for play yards on August 19, 2013, with an effective date of February 19, 2014.[56]

Figure 1 demonstrates continued deaths reported in the most recent years related to wedging/entrapment. Among the nine wedging/entrapment deaths reported since 2018, one occurred in 2021, six occurred in 2020, one occurred in 2019, and one occurred in 2018. One wedging/entrapment death involving an OEM mattress occurred in 2015 and one in 2017. There were also reports of nonfatal incidents in all three mattress fit categories since 2018.

[56] The final rule can be found at: Federal Register: Safety Standard for Play Yards.

Figure 1. Reported Fatal and Nonfatal Incidents Related to Fit Issues Involving a Mattress Product Being Used in a Play Yard: January 1, 2010–July 31, 2022.



Source: CPSRMS and NEISS databases.
Reporting is ongoing for CPSRMS; the years 2020–2022 are considered incomplete.

Appendix

Reported Fatalities – Summaries of Each Fatality Incident

Wedging/Entrapment or Gap Present Between Mattress and an End/Sidewall of Play Yard (21 deaths)

Among the 21 wedging/entrapment deaths, two deaths involved an OEM play yard mattress, 13 deaths involved after-market mattresses, and six incident reports did not have enough information to determine the type of mattress.

OEM Play Yard Mattress (2 deaths)

Incident 1 (from 2015; IDI[57] 150807CCC1815): This seven-month-old child was placed in a play yard face up wearing a cotton one-piece clothing article, and the child was found partially wedged in a gap between an OEM mattress and a mesh wall in the corner of the play yard, with the face of the child in contact with the mattress. The play yard was rectangular in shape and about the same size as a standard crib. Other the OEM mattress with no sheet covering the pad, no other items were reported present in the play yard environment.

Incident 2 (from 2017; IDI 170718CCC3096): This seven-week-old child was placed in a play yard face up with a blanket covering the body up to the chest area; the child was found with the face in an existing gap between the mattress and the middle of one of the long-sidewalls of the play yard. The play yard was rectangular in shape and about the same size as a standard crib. The play yard included an OEM mattress which consisted of two parts that were held fastened together but with no sheet covering the mattress, a doll, a stuffed animal, and a balled-up blanket. The child reportedly was not in contact with the blanket or toys when found.

After-Market Mattress (13 deaths)

Incident 3 (from 2011; IDI 120611CCC1731): This eight-month-old child was placed in a play yard in an unknown position and was found face down with the body entrapped in an existing gap of approximately three inches between a crib mattress and the mesh sidewall of the play yard. The play yard was rectangular in shape and about the same size as a standard crib. The play yard included a crib mattress with a loose-fitting sheet placed atop the OEM mattress, a bunched-up blanket, and three stuffed animal-like toys. It is unclear from the reports if any of the materials was touching or near the child's face when found.

Incident 4 (from 2013; IDI 140702CCC3689): This three-month-old child wearing only a diaper was placed in a play yard in an unknown position and found with the face and left shoulder of the child entrapped in an existing gap of approximately two or three inches between a full-sized crib mattress and a mesh sidewall of the play yard. The play yard was rectangular in shape and about the same size as a standard crib. Included in the play yard was: a crib mattress with a properly fitting fitted sheet placed atop the OEM mattress, a stuffed animal, two rattle toys, a pair of infant shorts, a pacifier, and two blankets draped over the rail on one end of the play yard and remained on the rail during the incident.

Incident 5 (from 2014; IDI 140609CCC1675*)*: This three-month-old child was placed in a play yard along with his twin on top of two mattresses, face down; child was found wedged in an

[57] IDI stands for In-Depth Investigation.

existing gap of approximately 1.5 inches between the top thicker mattress and the mesh sidewall of the play yard. The child's face was pressed into the side of the top mattress. The top mattress was reportedly between 3.75 and 4 inches thick, and the width of the top mattress was 2 inches shorter than the bottom mattress, which created the gap where the child became wedged. The bottom mattress was between 2 and 2.5 inches thick and left no gap between the mattress and the play yard sidewalls. There was no product information on these two mattresses, and it is possible that these were homemade products made from foam and covering material. The OEM mattress was likely not present in the play yard during the incident. The play yard was rectangular in shape and about the same size as a standard crib. Included in the play yard were two mattresses (unknown whether after-market or homemade) with a loose fitted sheet on the top-most mattress and the twin of the victim. No other items were reportedly present in the play yard environment.

Incident 6 (from 2014; IDI 150407HCC1448): This seven-week-old child was placed in a play yard face up wearing a diaper, one-piece clothing article, sweatpants, and socks, and found wedged in a gap of approximately 5 to 7 inches between a crib mattress and a mesh sidewall of the play yard, with the face pressed into the mesh on the bottom of the play yard. The OEM mattress was not present in the play yard during the incident, which exposed the bottom floor of the play yard. The play yard was rectangular in shape and about the same size as a standard crib. Included in the play yard was: a crib mattress (unknown if a fitted sheet was present); a baby quilt; a small blanket; and a pair of socks.

Incident 7 (from 2015; IDI 160812HCC2772): This 4-month-old child was placed in a play yard face down. According to detectives, the victim was found on his side with his face against the play yard's mesh sidewall, and the sidewall gap was approximately 1 inch wide. It is unknown whether the OEM mattress was present in the play yard during the incident. The play yard was rectangular in shape and about the same size as a standard crib. Included in the play yard was an after-market mattress (unknown if a fitted sheet was present), and at the opposite end of the play yard there was a blanket and a towel.

Incident 8 (from 2017; IDI 181105HCC3067): This five-month-old child was placed in a play yard face up wearing a diaper and a one-piece clothing article and found face down with body lying in a sideways position with right side including arm, leg, and face entrapped in a gap of approximately 1.5 inches between an added crib mattress approximately 5.5 to 6-inch-thick and the mesh sidewall of the play yard. The face was wedged between the mattress and the mesh sidewall of the play yard. The play yard was rectangular in shape and about the same size as a standard crib. Besides a crib mattress with a tight-fitting sheet placed atop the OEM mattress, no other items were present in the play yard.

Incident 9 (from 2017; IDI 190603HCC1480): This eight-month-old child was placed in a play yard face up wearing a diaper and a long-sleeved one-piece clothing article and found with body lying in a sideways position with left side including left arm and leg entrapped in a gap of approximately 1.5 inches between two added after-market mattresses that were each approximately 3 inches thick and a mesh sidewall of the play yard. The face of the child was facing the side of the bottom-most after-market mattress. The play yard was rectangular in shape and about the same size as a standard crib. Included in the play yard were two after-market crib mattresses (the bottom mattress had a fitted sheet, and the top mattress had no sheet) placed atop the OEM mattress and a blanket the size of a dish towel.

Incident 10 (from 2018; document number X1970400A): This four-month-old child was placed in a play yard in an unknown position and found face up and partially wedged in an existing gap of an unknown size between an added after-market mattress and a mesh sidewall of the play yard. The gap was filled by a rolled-up fleece blanket. The size and shape of the play yard are unknown. Other than the added after-market mattress and a fleece blanket, no other items were reported present in the play yard environment.

Incident 11 (from 2019; IDI 200127CBB1242): There were slightly conflicting reports about the details regarding this incident. This six-month-old child was placed in a play yard either face up or on the left side wearing a diaper, a dress, and pants, with a polyester blanket covering the lower legs of the child and found entrapped in a gap of an unknown size, between an after-market mattress and a mesh sidewall of the play yard. The head of the child was either wedged under the mattress or between the mattress and mesh sidewall of the play yard. It is unknown whether the OEM mattress was present in the play yard during the incident. The play yard was rectangular in shape and about the same size as a standard crib, and other than the after-market mattress covered by a fitted sheet and a polyester blanket, no other items were reported present in the play yard environment.

Incident 12 (from 2020; IDI 210405HCC3819): This eight-month-old child was placed in a play yard face up wearing a diaper and a shirt and found with one leg on top of the top mattress and the other leg, torso, and head entrapped in an existing gap of approximately 1.5 to 2 inches between an added five-inch-thick mattress and a mesh sidewall of the play yard. The face of the child was pressed into one of the mattresses. The top five-inch-thick mattress was placed atop either the OEM mattress or a second one-inch-thick after-market mattress. The play yard was rectangular in shape and about the same size as a standard crib. Other than a 5-inch-thick after-market mattress (unknown if a fitted sheet was present) and a 1-inch thick second mattress, no other items were reported present in the play yard environment.

Incident 13 (from 2020; IDI 210402HCC1642): This three-month-old child was placed in a play yard face down wearing a diaper and a one-piece clothing article and found face down entrapped in a gap of an unknown size between a 4-inch-thick crib mattress and a mesh sidewall of the play yard. The crib mattress was 10 inches shorter than the length of the play yard and 4 inches shorter than the width of the play yard, which left considerable gaps on at least two sides of the play yard, and possibly left gaps on all four sides. It is unknown whether the OEM mattress was present in the play yard during the incident. The play yard was rectangular in shape and about the same size as a standard crib. Other than the crib mattress covered by a fitted sheet and a pacifier, no other items were reported present in the play yard environment.

Incident 14 (from 2020; IDI 211013HCC3040*)*: This five-month-old child was placed in a play yard in an unknown position and found with the body wedged in a gap of an unknown size, between an after-market mattress, one or more blankets, and a mesh sidewall of the play yard. The face of the child was pressed into a mesh sidewall of the play yard. The play yard was rectangular in shape and about the same size as a standard crib. Included in the play yard were an after-market memory foam mattress, one or more heavy blankets, and an adult pillow.

Incident 15 (from 2021; IDI 220321HCC1228): This three-month-old child was placed in a play yard face down and found face down entrapped in an existing gap of “a few inches” between an after-market mattress and a mesh sidewall of the play yard. It is unknown whether the OEM

mattress was present in the play yard during the incident. The play yard was rectangular in shape and about the same size as a standard crib. Other than the added after-market mattress (unknown if the mattress was covered by a sheet or topper), no other items were reported present in the play yard environment.

Unknown or Vague Description of the Mattress (6 deaths)

Incident 16 (from 2010; IDI 110303CCC1350*):* This two-month-old was placed in a play yard face down. The cause of death was ruled an “accident” and recorded as "asphyxia due to wedging of face in corner of playpen", while lying on a mattress (unknown what kind of mattress or if a fitted sheet was present) with the head and mouth pressed up against a mesh sidewall of the play yard. The details regarding the circumstances that led to this fatality are vague. Items reported present in the play yard were an unknown type of mattress, a sleeping positioner pad, and several blankets. The size and shape of the play yard are unknown.

Incident 17 (from 2014; document number X1460710A): This six-week-old child was placed in a play yard in an unknown position and found face down entrapped between a mattress (unknown what kind of mattress or if a fitted sheet was present) and a mesh sidewall of the play yard. The details regarding the circumstances that led to this fatality are vague; no other items were reported present in the play yard during this incident. The size and shape of the play yard are unknown.

Incident 18 (from 2014; IDI 161027CCC1134): This six-month-old child was placed in a play yard in an unknown position and found entrapped between a mattress (unknown what kind of mattress or if a fitted sheet was present) and a mesh sidewall of the play yard. The details regarding the circumstances that led to this fatality are vague. No other items were reported present in the play yard environment. The size and shape of the play yard are unknown.

Incident 19 (from 2020; document number X2120497A): This five-month-old child was placed in a play yard in an unknown position and found entrapped between a mattress (unknown what kind of mattress or if a fitted sheet was present) and a mesh sidewall of the play yard. The details regarding the circumstances that led to this fatality are vague, and no other items were reported present in the play yard environment. The size and shape of the play yard are unknown.

Incident 20 (from 2020; document number X2140213A): This eleven-month-old child was placed in a play yard in an unknown position and found wedged between the “cushion and lining of (a play yard)”. The details regarding the circumstances that led to this fatality are vague. No other items were reported present in the play yard environment. The size and shape of the play yard are unknown.

Incident 21 (from 2020; IDI 210305HCC2409): This four-month-old child was placed in a play yard face down and found with the body lying in a sideways position entrapped between a mattress (unknown what kind of mattress or if a fitted sheet was present) and a mesh sidewall of the play yard. The details regarding the circumstances that led to this fatality are vague. No other items were reported present in the play yard environment. The size and shape of the play yard are unknown.

Mattress Shifted Allowing Contact or Entrapment with the Fabric Bottom of the Play Yard: Child moved the mattress up and had at least some body part trapped under the mattress (3 deaths)

Incident 22 (from 2011; IDI 130219CCC3404): This 11-month-old child was placed in a play yard in a sitting position, and the child was found with the head entrapped under an OEM mattress, such that the pad was pressed against the throat of the child. The body of the child was in a near standing position with feet planted on the top of the mattress, and the upper torso hunched over with the buttocks pointed upward. The play yard was rectangular in shape and about the same size as a standard crib. Other than an OEM mattress covered by an "unspecified sheet", no other items were reported present in the play yard environment.

Incident 23 (from 2016; document number 170613CCC1957): This nine-month-old child was placed in a play yard face up with the torso covered by a blanket and found face down in a corner of the play yard, lying suspended on the bottom fabric floor of the play yard. The OEM mattress "shifted" up allowing the child to become entrapped under the mattress. The play yard was rectangular in shape and about the same size as a standard crib. Other than an OEM mattress with a loose-fitting fitted sheet and a blanket, no other items were reported present in the play yard environment.

Incident 24 (from 2016; document number 170417CCC2592): This six-month-old child was placed in a play yard face up and found face down in an end of the play yard after pushing an OEM mattress aside and suffocating on the bottom fabric floor of the play yard. The OEM mattress was not properly fastened in place. The play yard was rectangular in shape and about the same size as a standard crib. There were no items reported present in the play yard environment.

Tab D: Human Factors Staff's Analysis of Petitions CP 22-1 and CP 22-2

United States
Consumer Product Safety Commission

Memorandum

Date: March 29, 2023

TO: Frederick DeGrano, Petition Project Manager
Division of Mechanical and Combustion Engineering,
Directorate for Engineering Sciences

THROUGH: Mark Kumagai, Associate Executive Director,
Directorate for Engineering Sciences

Rana Balci-Sinha, Director
Division of Human Factors,
Directorate for Engineering Sciences

FROM: Stephen Harsanyi, Engineering Psychologist
Division of Human Factors,
Directorate for Engineering Sciences

SUBJECT: Human Factors Analysis of Petitions CP 22-1 and CP 22-2

I. Introduction

Two petitions seek a rulemaking to amend the Commission's regulation, *Safety Standard for Play Yards*, 16 CFR part 1221, to address hazards to infants related to the addition of soft bedding to infant sleep areas (Mattress Thickness Petition) and to address the formation of sidewall gaps sufficient to entrap an infant (Standardized Size Petition).[58] The Consumer Product Safety Commission (CPSC or the Commission) docketed the Mattress Thickness Petition as CP 22–1 and the Standardized Size Petition as CP 22–2.

In this memorandum, staff of CPSC's Engineering Sciences Division of Human Factors (ESHF) provides an analysis of the petition requests, including a discussion of relevant information pertaining to the following: the subject hazards, incident data, consumer feedback, regulations, voluntary standards activities, child development, and public comments.

[58] On November 29, 2021, Carol Pollack-Nelson, Ph.D., of Independent Safety Consulting, LLC, Sarah B. Newens, M.S., of Safety and Systems Solutions, and Alan H. Schoem, Esq., (collectively "Petitioners") submitted two petitions to the Commission through the Office of the Secretariat, titled: (1) Petition to Require Minimum Thickness for Play Yard Mattresses ("Mattress Thickness Petition"), and (2) Petition to Standardize the Size of Play Yards and Play Yard Mattresses ("Standardized Size Petition") (collectively "petitions"). The petitions are available in Tabs A and B and through: http://www.regulations.gov, under Docket No. CPSC–2022–0015, Supporting and Related Materials.

II. Discussion

A. Subject Hazards and Petition Requests

In the Mattress Thickness Petition, the Petitioners asserted that consumers perceive play yard mattresses to be uncomfortable because the padding is too thin and firm, resulting in consumers adding soft bedding to play yards, and, thereby, creating an unsafe environment that poses, among other risks, a suffocation hazard from positional asphyxia.[59] The Petitioners requested the Commission update 16 CFR part 1221 such that play yard mattresses must have a minimum mattress thickness of 1.5 inches (with "minimal" tolerance) and a maximum thickness of 3 inches. Furthermore, the Petitioners requested that the Commission require a maximum sidewall gap of 0.5 inches to prevent sidewall entrapment. The Petitioners stated that mattresses measuring 2 inches to 3 inches thick that properly fit in their play yards (*i.e.,* with a gap between the side of the mattress and the mesh sidewall of a play yard no greater than 1 inch) can and have been used safely in play yards over the past decade. The Petitioners also concluded that no warning can overcome consumer perception that the existing thickness allowance for play yard mattresses is too thin and uncomfortable for their infants.

In the Standardized Size Petition, the Petitioners asserted that consumers have difficulty in selecting appropriate mattresses for their play yards, resulting in consumers using ill-fitting mattresses and creating an unsafe environment that poses risks of entrapment and positional asphyxia in gaps between the mattress side and play yard sidewall. The Petitioners requested that the Commission update 16 CFR part 1221 such that there are standard sizes (horizontal, interior dimensions) for play yards and play yard mattresses, with one size for each perimeter shape. The Petitioners explained that there are a variety of mattress sizes available in the market for a given perimeter shape, which leaves open the potential for consumers to select an ill-fitting mattress. The Petitioners stated that consumers should not have to measure or have uncertainty about the fit of the replacement mattress. Furthermore, the Petitioners suggested that consumers may add soft bedding materials other than mattresses, such as blankets, quilts, and pillows to the sleep environment because they find it difficult to identify an appropriate replacement mattress.

In support of the petitions, the Petitioners referred to ESHF staff's memoranda in several of CPSC staff's recent briefing packages, including staff's 2017 response to Petition CP 15-2, *Petition Requesting Rulemaking on Supplemental Mattresses for Play Yards with Non-Rigid Sides*,[60] the 2020 draft notice of proposed rulemaking (NPR) for crib mattresses,[61] and the 2021 draft final rule for crib mattresses:[62]

[59] For more information about the subject hazards, see the Health Sciences memorandum (Tab E; Johnson, 2023).
[60] Commission Briefing Package: Petition CP 15-2 - Petition Requesting Ban on Supplemental Mattress for Play Yards with Non-Rigid Sides - May 10 2017_with addendum: https://cpsc.gov/s3fs-public/Petition-CP-15-2-Petition-Requesting-Ban-on-Supplemental-Mattress-for-Play-Yards-with-Non-Rigid-Sides-May-10-2017_with-addendum.pdf?VersionId=A5jHAF103hZufDVuoRTKsfT9nu9dk4ly.
[61] Commission Briefing Package: Notice of Proposed Rulemaking - Safety Standard for Crib Mattresses: https://cpsc.gov/s3fs-public/Notice-of-Proposed-Rulemaking-Safety-Standard-for-Crib-Mattresses.pdf.
[62] Commission Briefing Package: Final Rule - Safety Standard for Crib Mattresses: https://cpsc.gov/s3fs-public/Final-Rule-Safety-Standard-for-Crib-Mattresses.pdf?VersionId=62bEXbfu7.mIoiiLfn_fbMWtFnEsgGON.

- Petition CP 15-2 included a request for the Commission to ban the sale of supplemental mattresses[63] for play yards. In ESHF staff's response to petition CP 15-2, ESHF staff discussed sidewall gap entrapment and how it relates to child development, as well as caregivers' comfort perceptions and uses of padding and soft bedding in play yards. ESHF staff cited research by Bayley (1969), explaining that infants typically develop in separate stages the motor skills to turn themselves, first to move from side to back (average age 1.8 months old), then from back to side (average age 4.4 months old), and then from back to stomach (average age 6.4 months old). ESHF staff explained that based on child development and other factors, children may maneuver into hazardous positions from which they cannot extricate themselves, such as in sidewall gaps. ESHF staff discussed fatal suffocation incidents involving play yards, which occurred between January 1, 2000, and December 31, 2016. The incidents included 14 fatal cases that involved or may have involved an after-market mattress in a play yard, at least seven of which involved a child entrapped between the mesh sidewall and a poorly fitting after-market mattress (where identified, gaps varied in width from 2 inches to 7 inches). ESHF staff explained that if consumers notice sidewall gaps, they may try to fill the gaps with soft material, such as towels, or they may disregard the gaps if they are not familiar with the hazard or believe the hazard is not particularly likely for their infant. ESHF staff also stated that due, in part, to the perceived hardness of OEM (original equipment manufacturer) play yard mattresses by consumers, the use of after-market mattresses and other cushioning items as a play yard sleeping surface is a foreseeable caregiver behavior. ESHF staff described incidents in which consumers added soft bedding material to play yards, such as foam, pillows, and couch cushions to soften the sleeping surface and increase perceived comfort for the infant.
- In CPSC staff's briefing packages supporting the NPR and draft final rule for crib mattresses, CPSC staff analyzed incident data associated with crib mattresses and after-market play yard mattresses. The analysis included data from CPSC's Consumer Product Safety Risk Management System (CPSRMS) and the National Electronic Injury Surveillance System (NEISS) spanning from January 1, 2010, through March 31, 2020. Additionally, CPSC staff analyzed CPSRMS reports spanning April 1, 2020, through April 30, 2021. In ESHF staff's memoranda supporting the NPR and draft final rule for crib mattresses, ESHF staff explained that numerous public awareness-raising campaigns have aimed to educate caregivers about the hazards associated with soft bedding in infant sleep areas, yet incident data and consumer research (see Section C, below, for examples) have shown it remains common for caregivers to add soft bedding to cribs, non-full-size cribs, and play yards, for reasons such as to provide comfort and warmth. The memoranda detailed the risks and incident data associated with entrapment in corner and sidewall gaps involving cribs, non-full-size cribs, and play yards, as well as suffocation in soft bedding, such as infants found face down in blankets. ESHF staff explained that a thick sleep surface, such as from a thick after-

[63] As discussed in the briefing package for petition CP 15-2, "supplemental mattress refers to the use-pattern of a product, which could be "supplementing" an existing mattress or "supplementing" the play yard itself. Staff assessed that "supplemental" is more descriptive of the use-pattern; whereas "after-market" is more descriptive of how the mattress is sold. Therefore, staff concluded that the term "after-market mattress" more clearly indicates any mattress sold independently from a play yard or crib that can be used as a sleeping surface inside the play yard or crib, whether used alone or with the original mattress. In addition, "after-market mattress" is the term defined in ASTM F2933-19 to include mattresses that are sold independently of play yards or non-full-size cribs.

market mattress or from combined mattresses, is especially concerning for sleep structures with flexible sidewalls, such as play yards, because the sidewall gaps typically expand more towards the center of the sidewalls, increasing the risk of limb and head entrapment and suffocation.

Discussed in Section D, below, to address the safety of crib mattresses, including after-market mattresses for play yards, the Commission established the *Safety Standard for Crib Mattresses* (16 CFR part 1241), and CPSC staff is continuing to work on OEM play yard mattress requirements with the ASTM F15.18 Subcommittee on Play Yards and Non-Full-Size Cribs.

B. Play Yard Gap Entrapment Incident Data

As mentioned above, CPSC staff's recent briefing packages analyzed incident data involving crib mattresses and play yard mattresses. For this memorandum, CPSC staff reviewed CPSRMS- and NEISS-reported incident data involving gap entrapment in play yards spanning January 1, 2010, through July 31, 2022. Additional hazards are discussed in Tabs C and E, such as reports of children getting trapped under OEM play yard mattresses. The CPSRMS incident reports identified 21 fatalities in which infants' arms, shoulders, torsos, faces, and heads were trapped in sidewall gaps, resulting in positional asphyxia. The victims ranged from 1 month to 11 months in age. The majority of the victims were between 2 months and 6 months of age (14 victims). At least two cases involved entrapment in a corner. At least two cases involved only the OEM mattress; however, these cases had multiple contributing factors to injury, such as the OEM mattress being used in the play yard's hanging bassinet mode in one case, and the OEM mattress potentially not being secured to the play yard floor in the other case. At least 13 cases involved after-market mattresses, and at least 2 of these 13 cases involved full-size crib mattresses. At least 12 cases involved the use of multiple mattresses. Where specified, the combined thickness of the involved mattresses was typically in excess of 3 inches. For example, IDI 190603HCC1480 involved an 8-month-old infant who asphyxiated from being wedged between a play yard sidewall and three stacked mattresses (an OEM play yard mattress and two 3-inch after-market play yard mattresses). In at least nine cases, soft bedding or padding, such as blankets, were used in play yards for comfort, warmth, and other reasons, including cases in which soft bedding or padding was used with after-market mattresses. In one case (X1970400A), a rolled blanket was positioned in between an undersized mattress and the sidewall, and the victim was found face-down partially wedged between the rolled blanket and the mattress side. Static gap measurements were provided in several reports, ranging from 1 inch to 10 inches in width (*e.g.,* IDI 160812HCC2772).[64] Similar to CPSC staff's previous incident data analyses involving play yards, in most cases, it is unknown how thick the involved mattresses were and how big the sidewall and corner gaps were, particularly what gaps would have been with horizontal force applied against the sidewalls simulating an infant's head and/or body against the sidewall.

The CPSRMS reports included three nonfatal entrapment incidents that involved infants "wedged" or "stuck" in the sidewall gaps of play yards. In each case, the play yard was in a bassinet configuration, or the victim was otherwise in a bassinet in a play yard. One victim was

[64] Note: IDI 160812HCC2772 has conflicting information so it is unclear what exactly transpired. According to the Sheriff's detectives, the victim's mother initially reported the sidewall gap was 1 inch in width, and the victim was found on his side with his face against the play yard's mesh side. The victim's mother later reported that the sidewall gap was ½ inch and denied that the victim was stuck in the gap with his face against the play yard side.

3 months old, another was 4 months old, and the age is unknown for the third victim. All three cases involved head entrapment.

Staff identified only one NEISS report that involved an injury associated with play yard gap entrapment, and it is unclear what occurred beyond a 6-month-old male's foot being caught between the "cardboard and mattress" of a play yard. While staff identified only one potentially relevant NEISS report, staff notes that NEISS reports typically contain only brief narratives culled from medical records developed during the emergency department visit, and therefore, it is common for details regarding gap entrapment to be omitted from NEISS data.

C. Findings from Consumer Studies

The Petitioners referred to the 2014 "Durable Nursery Products Exposure Survey (DNPES): Final Summary Report," by Westat.[65] The DNPES report detailed the findings of a survey conducted in 2013, which collected information about consumers' use of durable infant and toddler products. The survey used a national probability sample of households with children 5 years old and under. Among other questions, participants were asked about items added to sleep products under their children. The sleep product categories included cribs, play yards, bedside sleepers, bassinets, cradles, and infant hammocks. As the Petitioners pointed out, the researchers found that approximately 75 percent of play yard users reported placing an item (other than the intended mattress) under the child in a play yard. The items included blankets or quilts (~62%), pillows (~26%), and mattress pads (~12%). None of the respondents indicated that they used fitted sheets for play yards. Approximately 25 percent of the respondents reported not placing anything under their child other than the intended mattress. In comparison, regarding cribs, approximately 94 percent of crib users reported placing an item (other than the intended mattress) under the child in their crib. Items included fitted sheets (~84%), mattress pads (~50%), blankets or quilts (~36%), and pillows (~23%). Approximately 6 percent of the respondents reported not placing anything under their child in a crib other than the intended mattress. These findings suggest that consumers commonly add soft bedding materials under children in play yards as well as cribs, despite cribs typically having mattresses measuring 3 inches to 6 inches in thickness. Additionally, considering the large percentage of respondents who used fitted sheets for cribs, and that none of the respondents reported using fitted sheets for play yards, it is likely that respondents used soft bedding in play yards for more purposes than just added padding, such as warmth and covering the mattress.

The Petitioners also referred to the 2019 report, "Consumer Product Safety Commission (CPSC): Caregiver Perceptions and Reactions to Safety Messaging Final Report" (Safety Messaging Report), by Fors Marsh Group.[66] The Safety Messaging Report summarizes focus group research (six in-person focus groups) and a literature review conducted in 2019 pertaining to safe sleep practices in various products, including cribs and play yards. The participants expressed inconsistencies between their beliefs and behaviors regarding safe sleep

[65] The report, "Durable Nursery Products Exposure Survey (DNPES): Final Summary Report," with CPSC staff's statement, can be accessed using the following URL: https://www.cpsc.gov/s3fs-public/DurableNurseryProductsExposureSurveyDNPESFinalSummaryReport2014.pdf?VersionId=5R29kvpEAB20KnHt6tFzyTXsKxTvRJsM (or see CPSC.gov, "Other Technical Reports").

[66] The report, "Consumer Product Safety Commission (CPSC): Caregiver Perceptions and Reactions to Safety Messaging Final Report," with CPSC staff's statement, can be accessed using the following URL: https://www.cpsc.gov/content/Consumer-Product-Safety-Commission-Caregiver-Perceptions-and-Reactions-to-Safety-Messaging-Final-Report (or see CPSC.gov, "Other Technical Reports").

practices. While some participants did report actively making changes to their behaviors as a result of the risks conveyed by safety messages, many participants stated that convenience was an underlying motivator, and they did whatever it took to ensure their infants were "comfortable" and slept. The participants defined comfort by whether the infants slept all night or not. Overall, the participants reported they perceived cribs and play yards to have hard surfaces that are not comfortable for their infants. Laying a blanket down or purchasing a "comfortable" mattress were commonly reported additions to the sleep environment to make it more comfortable.

The majority of the participants who were grandparents reported that they added items such as pillows and blankets to sleep environments to provide comfort and warmth. Nearly all the participants indicated they were familiar with a warning label presented during the study, which included warnings to never add soft bedding under or beside an infant; however, most of the participants stated that they acted contrary to the warnings, and additionally, some participants stated they typically skimmed or skipped warnings. According to the Safety Messaging Report, the focus group feedback was consistent with previous studies, such as conducted by Ahlers-Schmidt et al. (2014), which identified a similar gap between knowledge and behaviors; that is, caregivers remained resistant to follow safe sleep recommendations. The Safety Messaging Report detailed concerns for safe sleep warnings being disregarded, such as by citing research from Joyner et al. (2009) and Kreth et al. (2016) pertaining to safe sleep warnings being discredited by product marketing that contradicted the warnings, such as depicting cribs and play yards with added soft bedding materials. The Safety Messaging Report recommended improving safety messaging by making warnings and marketing clear, concise, and consistent.

D. Human Factors Review of Standards

Tab F details the relevant mandatory and voluntary standards pertaining to play yards, OEM play yard mattresses, and after-market mattresses for play yards. Below, ESHF staff briefly summarizes and comments on the requirements, particularly those for marking and labeling, and performance requirements related to child development.

OEM Play Yard Mattresses: ASTM F406 and 16 CFR Part 1221

Play yards are subject to the mandatory *Safety Standard for Play Yards* (16 CFR part 1221), which incorporates by reference the sections of ASTM F406 – 19, *Consumer Safety Specification for Non-Full-Size Cribs/Play Yards,* that apply to play yards.[67] In accordance with ASTM F406 – 19, the filling material of an OEM play yard mattress, such as foam or fiberfill, shall not exceed 1 inch in thickness, and the total thickness of the mattress including all fabric or vinyl layers, filling material, and structural members, shall not exceed 1½ inches. OEM play yard mattresses do not have horizontal dimensional requirements, and there is no requirement restricting the size of sidewall gaps between the play yard mattress and the sidewalls of the play yard. Despite there being no sidewall gap width restrictions, ESHF staff assesses that infants are unlikely to suffocate in a sidewall gap produced by a play yard and play yard mattress compliant with the play yard regulation, because the thin mattress does not allow a hazardous pocket to form between the mattress and sidewall. As mentioned above, ESHF staff is particularly concerned about infants ages 2-to-6 months old suffocating in a sidewall gap from which they cannot extricate themselves, as children at these ages are still developing the skills

[67] Revisions to Safety Standards for Non-Full-Size Baby Cribs and Play Yards (2019): https://www.federalregister.gov/documents/2019/10/23/2019-23088/revisions-to-safety-standards-for-non-full-size-baby-cribs-and-play-yards.

to crawl and roll over. These are the ages most commonly identified in fatal gap entrapment cases. As discussed in Tab E, the immature breathing control system of young infants also predisposes them to risks of asphyxia. The ASTM F15.18 subcommittee has worked on potential probes to test play yard sidewall gaps for head entrapment, estimating 3.66 inches as a vulnerable infant's head breadth.[68] ESHF staff agrees with this measurement, which represents the 5th percentile 0-to-3-month-old,[69] because head breadth (this would be an infant face down or face up in a gap) is a smaller dimension than head length, height, and circumference, and coupling this measurement with a lower percentile, young age group incorporates a safety factor.

As CPSC staff has expressed in ASTM meetings,[70] CPSC staff is also concerned about the potential for positional asphyxia to result from limb entrapment in a sidewall gap. For example, arm entrapment can result in an infant's airway being occluded by the mattress or bedding if the infant is lying prone face down with their upper arm trapped in a sidewall gap and lacks the strength to raise or turn their head or free their arm. Arm entrapment could also increase the likelihood of face, head, or torso entrapment through wedging and consequent gap expansion. Based on the most recent Centers for Disease Control and Prevention (CDC) anthropometric reference data, the 10th percentile mid-upper arm diameter for male infants 2 months to 5 months of age is approximately 1.55 inches, and the 10th percentile mid-upper arm diameter for female infants 2 months to 5 months of age is approximately 1.5 inches.[71] Therefore, staff assesses that an infant's arm can become trapped in a gap that measures greater than 1.5 inches wide and greater than 1.5 inches deep, resulting in positional asphyxia. ESHF staff assesses this incident scenario is unlikely to occur with play yards and play yard mattresses compliant with the existing regulation (16 CFR part 1221) because (1) compliant mattresses have a maximum thickness of 1.5 inches and are typically under 1.5 inches in thickness to address manufacturing variance;[72] (2) an infant would need an unusually small arm (10th percentile female 2 months to 5 months of age) to become entrapped; and (3) the requirement for no more than 1 inch of soft-filling material would result in very limited inward deflection of the mattress sidewall in the case of a wedged limb (compared to mattresses with more soft filling material, which could deflect more inward from an infant pushing against the material).

The play yard regulation specifies marking, labeling, and instructional literature requirements regarding suffocation, including warnings explaining that infants can suffocate on soft bedding and in sidewall gaps involving an ill-fitting mattress. The rule also contains required warnings

[68] For example, see staff meeting log for Meeting of the ASTM Play Yard Mattress Fit & Thickness Task Group Call that occurred on October 4, 2018: https://cpsc.gov/s3fs-public/2018-10-04-ASTM-Play-Yard-Mattress-Fit-and-Firmness-Task-Group.pdf?VersionId=D2GZwqHuMKKiQsMLKHJiX9J0GkwSfwyW.

[69] Source: Snyder, R. (1976). Physical characteristics of children as related to death and injury for consumer product safety design. Applied Ergonomics, 7(2), p.112 (https://math.nist.gov/~SRessler/anthrokids/child.html#Head%20breadth).

[70] For example, see Staff meeting log for Meeting of the ASTM Play Yard Mattress Fit & Thickness Task Group Call on October 4, 2018 (link provided in footnote 73).

[71] Fryar, C.D., Carroll, M.D., Gu, Q., Afful, J., Ogden, C.L. (2021). Anthropometric reference data for children and adults: United States, 2015–2018. National Center for Health Statistics. Vital Health Stat 3(46). The CDC Anthropometric Reference is based on a nationally representative sample of the U.S. population, and the 2021 version is based on data collected from 2015 through 2018. According to this data, the 10th percentile mid-upper arm circumference for male infants 2 months to 5 months of age is 12.4 cm, and the 10th percentile mid-upper arm circumference for female infants 2 months to 5 months of age is 12 cm.

[72] As the petitioners noted, manufacturers in the ASTM F15.18 subcommittee have stated that their play yard mattresses are typically thinner than 1.5 inches due to manufacturing variance, in some cases with only 0.5 to 0.75 inches of filling material, in order to ensure their products are in compliance with 16 CFR part 1221.

directing consumers to never add an additional mattress, pillow, comforter, or padding to the play yard. For products that have a separate mattress that is not permanently fixed in place, there must be a warning specifying to use only the mattress/pad provided by the manufacturer.

In November 2022, ASTM published ASTM F406 – 22, which incorporated numerous changes to ASTM F406 – 19, including allowing mattresses to measure up to 2 inches in thickness. ASTM F406 – 22 states that mattresses 1.5 inches to 2 inches in thickness shall not form a sidewall gap greater than ½ inch when measured with the mattress centered in the manufacturer's recommended use position. As detailed in Tab F, the gap measurements specified in ASTM F406 – 22 are taken with no force applied to the sidewalls, which CPSC staff concludes is inadequate because the flexible nature of play yard sidewalls can enable significant gap expansion from the static measurement. In CPSC staff's testing of play yards and play yard mattresses, CPSC staff applied a 5-pound[73] lateral force against play yard sidewalls at varying heights to simulate an infant leaning against play yard sidewalls on mattresses of varying thickness. CPSC staff found that 0.5-inch static gaps expanded to greater than 1.5 inches, thereby forming pockets greater than 1.5 inches deep and wide, which could entrap a child, resulting in suffocation. CPSC staff also found that play yard sidewalls tended to expand more towards the center of the sidewalls, which means that thicker mattresses (*i.e.,* raising the sleep surface towards the center of the play yard sidewall) can increase the amount of gap expansion. Therefore, increasing the thickness of play yard mattresses would create the potential for a deeper and wider gap. Furthermore, the proposed thickness requirements in ASTM F406 – 22 do not specify a maximum thickness of the mattress filling material relative to the fabric layers, vinyl layers, and structural members, nor do they require that structural members are used. Consequently, as written, a play yard mattress may measure up to 2 inches in thickness with no structural members, which increases the risk of overly soft mattresses that can conform to an infant's face, as well as the risk of mattress sidewall material contracting inward as an infant wedges into a sidewall gap, further expanding the sidewall gap.

Consistent with the Consumer Product Safety Improvement Act of 2008 (CPSIA), PL 110-314 Sec.104(b), (4)(B) as revised by PL 112-28 (H.R. 2715) Sec. 3, ASTM informed CPSC of the revisions to the ASTM F406. CPSC staff submitted a briefing package to the Commission on February 15, 2023, addressing the revision and staff's concerns stated above, such as the risk of gap expansion of flexible play yard sidewalls and increased risk of suffocation without incorporating a firmness requirement for OEM play yard mattresses (further discussion below).[74] Staff concluded that the revision reduces safety for play yards, and recommended the Commission reject ASTM F406 – 22. On February 22, 2023, the Commission voted

[73] Five pounds is an appropriate lateral force based on calculations for the side force generated by large 3-to-5-month-old infants leaning against the play yard's sidewall at a 45-degree angle and empirical measurements generated by leaning a CRABI dummy against a vertical side. The CRABI (Child Restraint Airbag Interaction) Child Anthropomorphic Test Devices (ATD) are commonly known as crash test dummies and were developed to evaluate child-restraint systems in automotive crash testing. In 1990, the Society of Automotive Engineers (SAE) Mechanical Human Simulation Subcommittee formed the Infant Dummy Task Group. The group developed design specifications for three sizes of infant dummies: a 6-month-old, 12-month-old, and 18-month-old. The group approved the weight distribution and scaling methods.

[74] Commission Briefing Package: ASTM's Notice of a Revised Voluntary Standard for Play Yards – Feb 2023: https://cpsc.gov/s3fs-public/ASTMs-Notice-of-a-Revised-Voluntary-Standard-for-Play-Yards.pdf?VersionId=ogcqd17VstU50PjFj_jXZkfJ67ZI4tki

unanimously (4-0) to not accept ASTM F406 – 22 as the new mandatory standard for play yards.

ASTM F15.18 has also been discussing other potential, relevant changes to the standard, such as use of pictograms to convey warnings, and modifying the play yard mattress use warning statements to account for after-market mattresses rather than only OEM mattresses. Currently, unless the play yard is designed exclusively for play and not for sleep and is intended to be used without a mattress, a mattress must be provided by the manufacturer. The existing language in ASTM F406 – 19 and – 22 requires play yards that have a separate mattress that is not permanently fixed in place to have a warning that states: "Use ONLY mattress/pad provided by manufacturer." ASTM F15.18 has been considering alternative language for OEM play yard mattresses that directs the consumer to use only the OEM mattress or a mattress that specifically indicates it is compatible with the play yard's brand and model number, similar to the mandatory requirement for after-market mattresses for play yards.

After-Market Mattresses for Play Yards: ASTM F2933 and 16 CFR Part 1241

After-market mattresses for play yards are subject to the mandatory *Safety Standard for Crib Mattresses* (16 CFR part 1241), which went into effect on August 15, 2022.[75] The rule incorporates by reference ASTM F2933 – 21, *Standard Consumer Safety Specification for Crib Mattresses*, with modifications to make the standard more stringent.[76] Detailed in Tab F, among other requirements pertaining to after-market mattresses, the crib mattress rule specifies the following: (1) a requirement to test to specific sections in ASTM F406;[77] (2) a requirement that the after-market mattress must be at least the same size as the original equipment mattress, so long as it lays flat on the support structure; and (3) a requirement that the after-market mattress floor support structure be at least as thick as the original equipment mattress floor support structure. These requirements allow after-market play yard mattresses that may be thicker than what is provided by the original equipment manufacturer, but still limit such mattresses to the maximum thickness specified in ASTM F406 – 19 (*i.e.,* 1½ inches).

The Commission's crib mattress rule also includes firmness requirements for after-market play yard mattresses to reduce the risk of suffocation from a soft mattress conforming to the infant's face. Additionally, the rule includes various marking, labeling, and instructional literature requirements regarding soft bedding and gap entrapment. The warnings explain that babies have suffocated on soft bedding (*e.g.,* pillows, comforters, and extra padding) and in sidewall gaps (*e.g.,* involving a wrong-size mattress or extra padding), and direct consumers to not add soft bedding, padding, or an extra mattress. The warnings instruct consumers to never cover the faces or heads of babies with a blanket, to use only one mattress at a time, and to always check the mattress fit every time they change the sheets to verify play yard sidewall gaps are never larger than 1 inch when the mattress is pushed tight to one corner (this would mean a maximum sidewall gap of 0.5 inches when the mattress is centered and affixed to the bottom of the play yard). Furthermore, the rule requires that after-market play yard mattresses must have all warnings added by the OEM, assembly/attachment instructions provided with the OEM

[75] Safety Standard for Crib Mattresses (2022): https://www.federalregister.gov/documents/2022/02/15/2022-02414/safety-standard-for-crib-mattresses.
[76] Note: there is a revision of ASTM F2933 – 21, *i.e.,* ASTM F2933 – 21a; however, it is not incorporated into the Safety Standard for Crib Mattresses because it does not include important safety requirements specified in the rule.
[77] The *Safety Standard for Crib* Mattresses (16 CFR part 1241) includes a requirement to test after-market play yard mattresses to specific sections in ASTM F406, including: Stability; Cord/Strap Length; Mattress; Height of Sides; Floor Strength; and Mattress Vertical Displacement, when tested in the product it was designed for or intended to fit.

mattress, and the brand(s) and model number(s) of the play yards in which the mattress is intended to be used. The abovementioned warnings must be included on the retail packaging or visible when the product is in the retail packaging. Therefore, at the time of purchase of after-market play yard mattresses, consumers are provided information about compatible play yards.

If CPSC changes the mattress thickness requirement for OEM play yards in the *Safety Standard for Play Yards*, the mattress thickness requirements for after-market mattresses would also change to be consistent, based on section 5.9.1.1 of the *Safety Standard for Crib Mattresses*.

E. ESHF Assessment of the Petitioners' Requests

ESHF staff agrees with the Petitioners that soft bedding and gap entrapment are serious concerns for infant safety in play yards, and incident data have shown trends of caregivers using extra padding, soft bedding, and ill-fitting mattresses in play yards. However, as expressed in the public comments in response to the petitions[78] and discussed below, the Petitioners' proposed requirements are also associated with increased risks of suffocation, and the purported benefits are, at best, uncertain. Furthermore, incident data have demonstrated that the thicker mattresses used in cribs do not preclude caregivers from adding extra padding and soft bedding to mattresses. ESHF staff does not recommend a rulemaking to modify the play yard rule to allow a thicker mattress as requested by the Petitioners, because the available evidence does not support that increasing mattress thickness as proposed would improve the safety of play yards, and, instead, it would increase the risk of suffocation, unless the standard controls the tension of the mesh sidewall or provides an appropriate test for gap entrapment against a mesh sidewall, and also tests to ensure firmness of a thicker mattress. ESHF staff does not recommend standardizing the horizontal dimensions either, because the crib mattress regulation already requires both (1) all after-market play yard mattresses to be tested with the brand(s) and model(s) of play yards for which they are intended to replace the mattress, and (2) labeling on the mattress that specifically identifies that brand(s) and model(s). Testing the mattress with the play yard brands and models and identifying those brands and models that are compatible addresses a range of issues including fit, structural support, and attachment, and reduces potential consumer confusion with multiple advertised standard-size mattresses on the market.

Increasing Mattress Thickness

The Petitioners seek a rulemaking to amend the Commission's regulation, *Safety Standard for Play Yards* (16 CFR part 1221), to require a minimum play yard mattress thickness of 1.5 inches (with "minimal" tolerance) to reduce consumers' perception that "the play yard floor is too hard and soft bedding should be added" and a maximum of 3 inches, with a maximum sidewall gap of 0.5 inches to "effectively prevent entrapment between the mattress and the mesh." The proposed maximum sidewall gap of 0.5 inches aligns with CPSC staff's recommendation to

[78] Detailed in the Briefing Memorandum, during the public comment period, which closed on July 18, 2022, CPSC received four comments from the public pertaining to the subject petitions. Two of the comments were submitted by play yard manufacturers, one comment was submitted by the Juvenile Products Manufacturers Association (JPMA), and one comment was a joint letter submitted on behalf of Kids In Danger, Consumer Federation of America, Consumer Reports, and Keeping Babies Safe. The comments were generally in opposition to the proposed requirements on the basis of safety, monetary costs, utility, innovation, and environmental concerns, and existing consensus efforts in ASTM F15.18. The comments can be found in docket number CPSC-2022-0015 at http://www.regulations.gov.

ASTM, provided that the gap measurement incorporates an appropriate lateral force to simulate a child rolling onto and leaning against the sidewall.

As stated above, CPSC staff has supported ASTM F15.18's recommendation to focus primarily on gap entrapment of infants 2-to-6 months of age, which are ages particularly at risk for gap entrapment; however, as evidenced in the incident data, staff is aware of five cases in which older children were fatally entrapped in sidewall and corner gaps in play yards. These cases involved multiple mattresses and/or other contributing factors. ESHF staff agrees with the Petitioners that consumers too often perceive a play yard mattress as uncomfortably thin, and, for this reason and others such as warmth, there have been numerous incidents involving infants being seriously and fatally injured due to added padding, soft bedding, and ill-fitting mattresses. ESHF staff also agrees with the Petitioners that warnings about these hazards are limited in effectiveness, as they do not prevent the hazards, and studies and incident reports have shown that consumers often miss or disregard relevant warnings because they do not appreciate the likelihood and severity of the hazards, and because they are focused on trying to get their infants to go to and stay asleep. However, the DNPES, Safety Messaging Report, and incident data have shown that consumers commonly add padding and soft bedding to cribs as well, despite crib mattresses typically measuring 3 inches to 6 inches in thickness. Moreover, incident reports also demonstrate use of soft bedding in play yards with after-market mattresses, which typically measured around 3 inches thick and were used to supplement the OEM mattress. Additionally, based on CPSC's annual report for nursery product-related injury estimates for 2021, staff found similar reports of fatalities in baby cribs involving asphyxia from soft bedding.[79] Of the 137 deaths reported between 2017-2019 involving baby cribs, about 73 percent of the reports were associated with a cluttered sleep environment that led to asphyxia of the infant. These reports involved items of soft bedding in the sleep environment such as pillows, blankets, and/or comforters, among others. Therefore, the incident data and consumer self-reports do not support the Petitioners' hypothesis that requiring a minimum 1.5-inch play yard mattress thickness and increasing maximum mattress thickness requirements from 1.5 inches to 3 inches will adequately address the concern for consumer perceived discomfort with play yard mattresses 1.5 inches and lower in thickness.

Requiring a minimum thickness of 1.5 inches is unnecessary for providing a safe sleep environment, and it may introduce additional concerns. The current play yard regulation (16 CFR part 1221) specifies that play yard mattresses shall be provided with play yards intended for sleep, and the mattresses must be 1.5 inches or less in thickness. While some consumers may perceive this limit of 1.5 inches as too thin, this limit has afforded a safe sleep environment for infants. The CPSC and other health organizations, such as the American Academy of Pediatrics (AAP),[80] recommend that infants should have a firm, flat, and level sleep surface. Increasing the mattress thickness requirements such that mattresses must be between 1.5 inches and 3 inches would increase the potential for overly soft mattresses that could conform to an infant's face, unless an adequate firmness requirement is also devised. To address concerns for mattress deflection, particularly suffocation in an overly soft mattress, the *Safety*

[79] See CPSC report: *Injuries and Deaths Associated with Nursery Products Among Children Younger than Age Five* – November 2022: https://www.cpsc.gov/s3fs-public/Nursery-Products-Annual-Report-2022.pdf?VersionId=48HfEaAG2znYilGMU6I9EC.z8UMAe4Oy

[80] American Academy of Pediatrics Updates Safe Sleep Recommendations: Back is Best: https://www.aap.org/en/news-room/news-releases/aap/2022/american-academy-of-pediatrics-updates-safe-sleep-recommendations-back-is-best/

Standard for Crib Mattresses (16 CFR part 1241) requires a firmness test for after-market crib mattresses; however, currently there is no such test for OEM play yard mattresses. The ASTM F15.66 subcommittee for crib mattresses is in the process of conducting further evaluation of firmness tests.

As discussed above, CPSC staff has been working with ASTM to find ways to increase play yard mattress thickness without exacerbating current hazards or introducing new hazards, such as to address gap expansion and the escalated risks of head, limb, and torso entrapment between the mattress and sidewalls. A sidewall gap that forms a pocket greater than 1.5 inches wide and 1.5 inches deep has the potential to entrap an infant resulting in positional asphyxia, and, therefore, given a potential gap expansion from flexible play yard sidewalls, requiring mattresses to be between 1.5 inches and 3 inches thick could increase the likelihood of hazardous gaps, resulting in suffocation (see Section D, above, for more information). This entrapment risk is further exacerbated if increasing the softness of the mattress results in greater inward deflection of the mattress from the infant wedging in the sidewall gap. Thicker mattresses, if segmented, as is common practice for play yards, may result in larger segment gaps, increasing the risk of suffocation or other respiratory distress in the "V" shape formed in segmented mattresses seams.[81] Public comments on the petition claimed that increasing the thickness of play yard mattresses would result in the mattresses no longer being able to wrap around collapsed play yards, requiring additional fasteners and adding to the complexity of the products. While this concern may have some merit, ESHF staff is unable to comment at this time on the extent to which such a change would adversely impact consumers' safe operation of the product, such as the likelihood of consumers fastening and assembling the product appropriately. In general, it is better to reduce the opportunities for usage error.

Additionally, one commenter stated that increasing play yard mattress thickness would result in play yard-bassinet combination units being sold with two separate mattresses (one to meet the 1.5-inch maximum thickness requirement for the bassinet and one to take advantage of the proposed 3-inch thickness requirement for the play yard), and that some consumers may stack both mattresses in the play yard or bassinet. This supplemental use of mattresses would increase the likelihood of suffocation. Staff has no data that would establish to what extent this behavior would occur. There are combination play yard-bassinet units that come with two mattresses, and staff has not identified a hazard pattern associated with both play yard and bassinet mattresses being provided. Typically, when a separate bassinet mattress is provided, the bassinet mattress is quite different in size, rigidity, and how it attaches to the bassinet, and is unlikely to be confused with the play yard mattress and used in the play yard configuration. For models in which the play yard interior dimensions are the same or similar to the bassinet interior dimensions, this behavior would be more likely and concerning.

Standardizing Play Yard and Mattress Horizontal Dimensions

The Petitioners seek a rulemaking to amend the Commission's regulation, *Safety Standard for Play Yards* (16 CFR part 1221), to mandate horizontal dimensions (*e.g.,* length and width) for play yards and play yard mattresses, with one size for each interior perimeter shape. At this time, there are insufficient data to justify specific perimeter sizes. ESHF staff agrees with the Petitioners that, historically, there has existed ambiguity for consumers selecting appropriate

[81] ASTM F2194-22e, Standard Consumer Safety Specification, section 6.8 Bassinets with Segmented Mattresses: Flatness Test requires the V shape formed by a folded or segmented mattress remain 10 degrees or less to address a suffocation hazard associated with segmented mattresses.

after-market mattresses for their play yards, and the requirements in applicable regulations should not rely solely on the consumer correctly measuring the products and identifying hazardous gaps. However, as discussed in the next paragraph, this ambiguity has been addressed by the new *Safety Standard for Crib Mattresses.* Additionally, standardizing the horizontal dimensions of play yards and play yard mattresses could have the unintended effect of leading consumers to purchase unsafe after-market mattresses for their play yards.

As stated above, unlike a crib, a play yard intended for sleep is required to be sold with a correctly sized mattress that is designed to be safe in the play yard. Therefore, the concern for horizontal dimensions pertains to replacement mattresses, such as after-market mattresses that are not provided by the OEM. As of August 15, 2022, in accordance with the *Safety Standard for Crib Mattresses* (16 CFR part 1241), after-market play yard mattresses shall meet the same specifications as the OEM mattresses they are intended to replace, including all warnings and assembly/attachment instructions. After-market play yard mattresses must specify the brand(s) and model number(s) of the play yards in which the mattresses are intended to be used. This information must be visible when the product is in its retail packaging, and it must be included on-product and in instructional literature. The crib mattresses regulation aims to address unsafe use of after-market mattresses, including the formation of hazardous gaps, and it helps consumers identify appropriate replacement mattresses. It is conceivable that some consumers may continue to purchase an inappropriate mattress despite these changes; however, given the recency of the rule, ESHF staff is unable to determine if there remains significant confusion in the market regarding this issue.

For consumers who do not read and heed the warning to use an appropriate mattress for the specific play yard brand and model, standardizing the horizontal dimensions may have the unintended effect of adding confusion to the market, resulting in consumers selecting inappropriate mattresses for play yards. Play yard mattresses vary in meaningful attributes other than their horizontal dimensions, such as structural integrity and means of securing the mattresses to the play yards. For example, if all play yards with rectangular interiors have the same lengths and widths, then consumers may be more inclined to assume they can use any rectangular after-market mattress for their rectangular play yard, resulting in consumers using play yard mattresses that do not sufficiently, if at all, fasten to the bottom of the play yard. Adequate fastening is a safety concern, as staff identified 42 incident reports that described children becoming trapped under the bottoms of their play yard mattresses, such as from the latching mechanisms (*e.g.,* hook-and-loop straps) not being used, not being used properly, or otherwise becoming loose (see Tabs C and E).

Additional Points Raised in Public Comments

In addition to continuing consensus standards activities, public comments on the petitions shared alternative approaches for addressing the subject hazards as summarized below.

Consumer Education. CPSC could continue consumer education efforts to reinforce the importance of using play yards safely, including to never place padding, soft bedding, or supplemental mattresses under a sleeping infant, and to verify that their play yard mattresses are appropriate for their play yards. ESHF staff supports this approach; however, ESHF staff cautions that, while similar outreach efforts from CPSC and other consumer advocacy groups

have played an important role,[82] such efforts have not been adequate for convincing consumers as a whole to change these behaviors. As discussed above, research shows that consumers may disregard such warnings when compliance risks interfering with their infants' sleep or their perception of their infants' comfort.

Consumers potentially relying on hazardous alternatives. Additionally, most of the public comments stated that the requirements proposed in the petitions could result in consumers selecting hazardous alternatives, such as if suitable play yards are more expensive or unavailable for some period of time following promulgation of the new requirements. For example, comment CPSC-2022-0015-0004 from JPMA, stated that it would take an estimated 3-to-5 years to completely re-design product lines for many of its members. The commenters also claimed that the proposed requirements would take safe products off the market and limit innovation that could otherwise improve the safety of play yards. ESHF staff shares the concern that consumers may choose unsafe alternative sleep environments if the proposed changes impact the affordability and availability of the products they desire; however, it is uncertain to what extent the proposed requirements would present such an outcome.

III. Conclusion

ESHF staff reviewed Petitions CP 22-1 and CP 22-2 and assessed the subject hazards, incident data, consumer feedback, regulations, voluntary standards activities, child development, and public comments on the petitions. While staff shares the Petitioners' concerns regarding use of soft bedding and ill-fitting mattresses in play yards, as discussed in this memorandum, staff does not conclude that the Petitioners' proposed requirements are appropriate for addressing these hazards.

ESHF staff concludes that the available evidence does not support that increasing mattress thickness would improve the safety of play yards. Incident data and consumer self-reports have demonstrated pervasive use of extra padding and soft bedding with crib and after-market play yard mattresses measuring 3 inches and greater in thickness. Increasing play yard mattress thickness may, in contrary, reduce the safety of play yards by the formation of a hazardous gap/pocket due to the flexible play yard sidewalls and thicker mattress. CPSC, AAP, and other consumer safety organizations recommend firm, flat, and level sleep surfaces for infant safety. If more soft filling material is added to thicken the mattresses to address consumer perceived discomfort with thin mattresses, the mattresses could obstruct an infant's airway increasing the risk of suffocation, unless there are tests to ensure adequate mattress firmness. Adding soft filling material could also exacerbate the risk of gap entrapment if it results in greater inward deflection of the mattress sidewall, thereby expanding the sidewall gap. Due to the flexibility of play yard sidewalls, adding to the height of the sleep surface by requiring thicker mattresses could result in greater sidewall gap expansion unless the standard controls the tension of the mesh sidewall or provides an appropriate test for gap entrapment against a mesh sidewall. Additionally, thicker mattresses may have larger segment gaps for segmented mattresses, increasing the risk of suffocation in the segment gaps.

[82] As discussed in ESHF staff's memorandum supporting the NPR for crib mattresses, numerous public awareness-raising campaigns have aimed to educate caregivers regarding the subject hazards, such as "Safe to Sleep" (formerly, "Back to Sleep," see https://safetosleep.nichd.nih.gov/activities/campaign), "ABC's of safe sleep" (see https://www.aappublications.org/news/2016/10/24/SIDS102416), and "Safe Sleep/Bare is Best" (see https://www.cpsc.gov/Safety-Education/Neighborhood-Safety-Network/Posters/Safe-Sleep-for-Babies).

ESHF staff also concludes that standardizing play yard and mattress interior horizontal dimensions is not necessary given the crib mattress regulation already requires all after-market play yard mattresses to be tested with the brand and model play yard for which they are intended to replace the mattress as well as requiring labeling on the mattress that specifically identifies that brand and model. Testing the mattress with the play yard brands and models and identifying those brands and models that are compatible addresses a range of issues including fit, structural support, and attachment, and reduces potential consumer confusion with multiple advertised standard-size mattresses on the market.

IV. References

Ahlers-Schmidt, C., Schunn, C., Lopez, V., Kraus, S., & Sollo, N. (2016). A comparison of community and clinic baby showers to promote safe sleep for populations at high risk for infant mortality. *Global Pediatric Health, 3*(0), 2333794X15622305. https://doi.org/10.1177/2333794X15622305

Bayley, N. (1969). *Manual for the Bayley scales of infant development*. New York: The Psychological Corporation.

Fors Marsh Group (August 2019). *Consumer Product Safety Commission (CPSC): Caregiver perceptions and reactions to safety messaging final report*. U.S. Consumer Product Safety Commission, Bethesda, MD.

Fryar CD, Carroll MD, Gu Q, Afful J, Ogden CL (2021). Anthropometric reference data for children and adults: United States, 2015–2018. National Center for Health Statistics. Vital Health Stat 3(46).

Joyner, B., Gill-Bailey, C., & Moon, R. (2009). Infant sleep environments depicted in magazines targeted to women of childbearing age. *Pediatrics, 124*(3), e416–22. https://doi.org/10.1542/peds.2008-3735

Kalsher & Associates (October 2021). *CPSC Warning Label Safety Symbol Research: Final Report*. U.S. Consumer Product Safety Commission, Bethesda, MD.

Kreth, M., Shikany, T., Lenker, C., & Troxler, R. (2017). Safe sleep guideline adherence in nationwide marketing of infant cribs and products. *Pediatrics*, *139*(1). https://doi.org/10.1542/peds.2016-1729

Melia, K.L. and Jenkins, J.L. (November 2014). *Durable nursery products exposure survey (DNPES): Final summary report*. U.S. Consumer Product Safety Commission, prepared by Westat.

Nesteruk, H. E. J. (2017). *Petition CP 15-2: Petition requesting rulemaking on supplemental mattresses for play yards with non-rigid sides*. Staff Briefing Package, U.S. Consumer Product Safety Commission, Bethesda, MD.

Nesteruk, H. E. J. (2020). *Draft notice of proposed rulemaking for crib mattresses under the Danny Keysar child product safety notification act*. Staff Briefing Package, U.S. Consumer Product Safety Commission, Bethesda, MD.

Nesteruk, H. E. J. (2021). *Draft final rule for crib mattresses under the Danny Keysar child product safety notification act*. Staff Briefing Package, U.S. Consumer Product Safety Commission, Bethesda, MD.

Westat (November 2014). *Durable Nursery Products Exposure Survey (DNPES): Final Summary Report*. U.S. Consumer Product Safety Commission, Bethesda, MD.

Tab E: Health Science Staff's Assessment of Petitions CP 22-1 and CP 22-2

United States
Consumer Product Safety Commission

Memorandum

TO: Frederick DeGrano, Petition Project Manager
Division of Mechanical and Combustion Engineering,
Directorate for Engineering Sciences

DATE: March 29, 2023

THROUGH: Stefanie Marques, Ph.D., Supervisory Scientist
Division of Pharmacology and Physiology Assessment,
Directorate for Health Sciences

FROM: Ashley Johnson, Ph.D., Physiologist
Division of Pharmacology and Physiology Assessment,
Directorate for Health Sciences

SUBJECT: Health Science Staff's Assessment of Petitions CP 22-1 and CP 22-2

I. Introduction

In this memorandum, staff from the CPSC Directorate for Health Sciences (HS) provide an assessment and analysis of the petition requests, including: a review of fatal and nonfatal incidents relevant to the petition, a discussion of the most current medical literature pertaining to the pathophysiology of positional asphyxia, the mechanisms and severity of injury associated with both wedging and entrapment due to sidewall gaps in mattresses, and the addition of soft bedding to an infant sleep setting.

II. Discussion

A. Incident Data Health Sciences Analysis

Directorate for Epidemiology (EPHA) staff conducted a search of CPSC databases[1,2] from January 1, 2010, through July 31, 2022, to identify incidents relevant to the petitions. CPSC staff identified 24 fatal incidents and 61 nonfatal incidents that describe mattress fit issues. Mattress fit issues include wedging or entrapment between a mattress and a mesh sidewall of a play yard; a mattress that moved or shifted in some way allowing contact or entrapment between the mattress and the fabric floor of the play yard; or a fitted sheet or mattress cover, protector, or topper that caused a mattress to bend, buckle, fold up, or create a gap between the mattress and a sidewall of the play yard. See the EPHA Tab C for information pertaining to extraction criteria, a table of reported fatal and nonfatal incidents related to the petition, and a detailed account of each of the 24 fatalities.[3]

HS staff reviewed all 24 fatal incidents to identify the hazard pattern and the cause of death. This was done using all available source documents from Injury or Potential Injury Incident (IPII) reports or from In-Depth Investigations (IDI), where available, including death scene investigations, police department incident reports, medical examiner (ME) reports, narratives from caregivers and witnesses, and death certificates. HS staff identified positional

asphyxia/suffocation as a risk factor associated with play yard deaths, which was primarily due to unsafe sleep settings such as entrapment and wedging in gaps and pockets caused by an ill-fitting mattress. The incident reports also describe scenarios of infants being placed to sleep on one or more items of soft bedding that included blankets, adult pillows, extra mattresses, and foam pads. Caregivers may place items of soft bedding in an infant's sleep setting for warmth and/or because they perceive the surface as too uncomfortable or too hard (see Human Factors Tab D for discussion on caregiver behavior).[4] HS staff also reviewed all 61 nonfatal incidents. In some incidents, the child was present within the product during the mattress fit incident but was not injured. In other incidents, the child was not located within the product at the time of the mattress fit incident. Of the nonfatal incidents, there were 7 nonfatal injuries, with 1 injury requiring medical attention and 1 injury requiring hospitalization. Although most nonfatal incidents did not report an injury, HS staff recognizes that a child placed in a play yard environment with a mattress fit issue could potentially suffer an injury or death due to positional asphyxia/suffocation.

Of the 24 fatal cases, the official cause of death was listed as positional asphyxia in 19 cases, as sudden unexpected infant death (SUID) in 1 case, as undetermined in 2 cases, and was not available in 1 case. Twenty-one incidents were wedging or entrapment incidents, where an infant was found wedged/entrapped in a hazardous gap between a mattress and the sidewall of the play yard. Three fatal incidents involved a child who lifted a mattress to become entrapped between the mattress and the floor of the play yard. These 3 fatal incidents involved an OEM mattress and involved an 11-month-old, a 9-month-old, and a 6-month-old child.

Of the 21 fatal incidents that involved entrapment and wedging in a gap between the mattress and the sidewall of the play yard, in 13 incidents, the mattress was an after-market mattress, 2 incidents involved OEM mattresses, and 6 incidents were unknown or could not be determined from source documents. These incidents describe the victims found wedged or entrapped between the play yard mattress and either the sidewall or corner of the play yard with their head, torso, arm, and/or leg in a gap created by an ill-fitting mattress. In some incidents, the area of entrapment (side or corner) within the play yard was unknown. Where recorded, the size of the space between the edge of the mattress and the play yard side varied in width from 1 inch to 10 inches. In the incidents where a gap was measured, the sizes were noted as: as "a few inches" (220321HCC1228), ~10 inches on the long side and ~4 on the short side (210402HCC1642), 1.5 inches (140609CCC1675, 190603HCC1480), 1.5-2 inches (181105HCC3067), 2-3 inches (140702CCC3689), and 5-7 inches (150407HCC1448). The mattresses ranged in thickness between 1 and 6 inches, when documented, and some incidents involved multiple mattresses. The age of the victims ranged from 1 to 11 months, with an average age of 4.75 months. Infants under 12 months old are at risk for positional asphyxia and sudden infant death syndrome (SIDS), with peak risk occurring when an infant is 2-6 months old (see discussion below). Seventeen incidents involved male victims and 4 incidents involved female victims. Safe sleep infant settings include placing infants in a supine (face up) position. Victims were placed by a caregiver in a position other than supine (side or prone (face down)) in 7 cases and in an unknown position in 7 cases. Safe infant sleep settings also include a firm, flat surface without the addition of soft bedding. Soft bedding was present in 10 incidents, absent in 5 cases, and unknown in 6 cases. Soft bedding included various types of blankets (baby blankets, baby quilts, blankets of unknown type, and heavy blankets), loose-fitting sheets, adult pillows, and pads of unknown type. In one incident, a victim was found face-down partially wedged between a rolled blanket used to fill a gap between the undersized after-market mattress and the sidewall of the play yard (X1970400A). In another incident, the victim was

found with their body wedged between a foam mattress, heavy blankets, and the sidewall of the play yard, lying prone with their face slightly turned and airway likely obstructed (211013HCC3040).

The descriptions of the position of found infants varied due to the nature of wedging or entrapment incidents and are outlined below as stated in the reports:

- wedged on right side between mattress and sidewall with face into mesh
- wedged with between mattress and sidewall or head underneath mattress
- wedged face down between sidewall and mattress
- wedged with between mesh sidewall and crib mattress and face down with head hyperextended backwards
- face down and the left side of face was partially wedged between mattress pad and corner or play yard
- face down between edge of mattress and sidewall
- face down partially wedged between rolled blanket used to fill gap between undersized mattress and sidewall
- face down, wedged in a small gap between the edge of the mattress and the wall of the play yard
- found lying on a mattress with his head and mouth up against sidewall
- found face down on his side with side of face against the play yard's mesh sidewall
- found wedged between mattress and side of crib with right arm stuck under mattress
- lying face down with his head and left shoulder wedged between the mesh wall of the play yard and a full-size crib mattress
- lying face down, wedged between mattress and sidewall
- lying on side, face down with face, head, and torso wedged between mattress and sidewall, body twisted to the left side with right arm down
- lying on side with face in gap between mattress and sidewall
- lying prone, with face pressed into a meshed area of the play yard and against a nearby wall; head slightly turned with nose and mouth appearing obstructed; body wedged between foam mattress, heavy blankets, and play yard sidewall
- wedged between cushion and sidewall
- wedged between mattress and sidewall
- wedged between the mesh sidewall and the top mattress pad with face pressed against mattress pad
- wedged between top mattress and sidewall with face into mattress, left leg on top of mattress and right leg inside gap, head and torso in gap

B. Pathophysiology of Positional Asphyxia and Injury Mechanism Analysis

Positional asphyxia is a type of asphyxia associated with abnormal body position, where the position of the subject compromises adequate breathing.[5-7] Death is caused by body position that prevents adequate gas exchange or causes direct obstruction of the airways (e.g., smothering by an object) and by the failure or inability to move to another position. Autopsy findings in cases of positional asphyxia are commonly minimal and nonspecific and can include petechial hemorrhages (small red or purple spots caused by ruptured capillaries) of the conjunctivae (mucous membrane that lines the inside of the eyelids and cover the sclera, the whites of the eyes), viscera (internal organs), and/or skin and cerebral and/or pulmonary edema

(swelling of the brain and/or heart). Other causes of death (natural and unnatural) must be excluded. Thus, in the absence of decisive findings, the pathological diagnosis of a medical examiner can include the medical history of the victim and the circumstances of the death, including the death scene investigation, in addition to a physical examination and/or autopsy.[8,9] Asphyxia in infants can result from covering of the mouth and nose with soft bedding, overlay, entrapments, wedging of the head with mouth and nose pressed into bedding, strangulations, and prone or side positioning. Death as a result of positional asphyxia can occur in as little as two to three minutes.

An excessive gap is a recognized entrapment hazard that can cause death by positional asphyxia/suffocation. Infants found in this compromised position, with their nose and mouth pressed against the mattress or play yard sidewall and head, torso, arm, and/or leg entrapped in a gap caused by an ill-fitting mattress are likely to remain in this position and experience compromised airflow, which creates unfavorable respiratory and cardiac dynamics. Thick mattresses (181105HCC3067), multiple mattresses (140609CCC1675, 190603HCC1480, 210405HCC3819, 210402HCC1642), and additional bedding used to raise the level of the sleeping surface (211013HCC3040) can pose additional risks by increasing the chances of forming a larger pocket between the edge of a mattress and the sidewall of a play yard. Thus, a child can roll into the mesh sidewall of a play yard and become wedged or entrapped face down in a depression formed in the play yard floor in areas that are not covered by the mattress. Infants can have their torso, arm, leg, and/or head partially or fully entrapped in the gap or pocket. The scenarios in which infants became entrapped in a hazardous gap between the mattress and play yard sidewall are described above in the Incident Data Analysis section. Previous research outlines the mechanism of asphyxia after gap entrapment or wedging, which is hypothesized to compromise both respiratory and cardiovascular functions, which are ultimately linked to maintain homeostasis (the optimal physiological functioning and regulation of body systems). The infant can asphyxiate against soft bedding if the nose and mouth are engaged against soft bedding or the mattress within the gap, which occludes the airway and prevents breathing.[10-14] Depending on the circumstances of entrapment or wedging, the inversion of the upper body (in whole or part) interferes with normal respiration and circulation by compressing or flexing the torso to make breathing less effective; increases intrathoracic pressure and compression of the vena cava and carotid sinus (which changes blood distribution and reduces cardiac performance); and/or restricts the posture of the neck (hyperflexion or hyperextension) which can impede respiratory movements and lead to airway obstruction.[15-17] Sustained pressure on the neck by the weight of the mattress can lead to asphyxia by strangulation.[18,19]

Soft bedding, which can occlude an infant's airway and cause asphyxia, was commonly placed into infant sleep settings according to the narratives in the CPSRMS-reported incidents (110303CCC1350, 211013HCC3040, 200127CBB1242, X1970400A, 190603HCC1480, 170718CCC3096, 150407HCC1448, 140702CCC3689, 120611CCC1731, 110303CCC135). Petitioners cited the Durable Nursey Products Exposure Survey (DNPES) Final Summary Report, a survey which collected information about consumer use of durable nursery and toddler products. As part of the survey, consumers were asked about items added to sleep products (cribs, play yards, bassinets/cradles/infant hammocks, and bedside sleepers) under their children and infants. While 25% of respondents reported placing nothing under their child in a play yard other than a mattress, 75% of consumers placed an additional item under their child, including blankets or quilts (62.34%), pillows (26.19%), and mattress pads (12.04%). However, the DNPES also identifies soft bedding that is frequently placed in cribs, which have mattresses that are typically 3 to 6 inches in thickness. Approximately 94% of crib users reported placing an item other than a crib mattress under the child in their crib, including

fitted sheets (84.35%), mattress pads (50.15%), blankets or quilts (35.81%), and pillows (23.02%). These findings suggest that consumers commonly add soft bedding to all sleep settings, regardless of perceived comfort level.

Infants are at risk of asphyxia when placed in a prone or side position on soft bedding, which can occlude the airway (mouth and nose). Infants can also unexpectedly roll and be unable to reverse action and extract themselves from a hazardous situation because either the presence of excess soft bedding prevents it, or the infant was physically incapable of rolling back. If the nose and mouth are occluded in any scenario, it may lead to asphyxia. For example, a 5-month-old infant was found face down and unresponsive on a sagging, secondhand cot which had formed a trough. Surrounded by excess bedding, including a soft foam mattress, pillows, and layers of soft bedding, the victim asphyxiated.[20] As discussed above, in the CPSRMS incidents, soft bedding included various types of blankets (baby blankets, baby quilts, blankets of unknown type, and heavy blankets), loose-fitting sheets, adult pillows, and pads of unknown type. In one incident, the soft bedding was being used to fill a hazardous gap (X1970400A). In another incident, the victim was found wedged between foam mattress, heavy blankets, and crib side, lying prone with face "slightly turned" and airway likely obstructed (211013HCC3040).

Infants differ greatly in their developmental skills in their first year of life. Unlike healthy adults, the limited physical and developmental capabilities of infants render them susceptible to asphyxiation in certain sleep settings. The American Academy of Pediatrics (AAP) recommends that infants be placed to sleep in a supine position and that soft bedding be avoided in the sleep setting.[21] Infants younger than 12 months of age are considered at risk of positional asphyxia; however, infants 2-6 months of age, premature infants, and infants who are born as a set of multiples are particularly vulnerable and are at the highest risk due primarily due to developmental delays and an immature breathing control system in the first few months of life.[22-25] Physiological abnormalities and delays in the development of vital systems can further hamper an infant’s ability to react to a hazardous sleep setting. This age group is at risk for SIDS, which appears to be related to the development and maturity of the respiratory system. SIDS is thought to occur when an infant with an underlying biological vulnerability, who is at a critical development age, is exposed to an external trigger, such as an unsafe sleep setting.

Once an infant’s airflow is compromised, decreased levels of oxygen in the blood can further impair the ability of the infant to respond to the situation. If an infant cannot respond, a feedback loop of decreased heart and respiration rate develops that can eventually lead to cessation of breathing and may become fatal if uninterrupted. The prognosis for hypoxic (a state of low levels of oxygen in body tissues) victims due to smothering depends primarily on the extent of oxygen deprivation, the duration of unconsciousness, and the speed of resuscitation. Rapid reversal of the hypoxic state is essential to prevent or limit the development of pulmonary and cerebral edema, and the rapidity of this reversal ultimately predicts the patient’s clinical prognosis. Thus, victims who are oxygen deprived for short durations or quickly receive cardiopulmonary resuscitation to reestablish air flow have the most favorable clinical outcomes. Because these types of entrapment incidents and asphyxiations due to soft bedding often happen while an infant has been left alone to sleep, while not under supervision of a caregiver, the likelihood of the caregiver becoming aware of the event and rescuing the child is often low. Without immediate adult intervention to free the child from the entrapment, the potential for serious injury or death exists. The severity of oxygen deprivation ultimately governs the victim’s chance for survival and the degree of neurological damage. The extent of injury is directly related to the duration and magnitude of hypoxia. Inadequate supply of oxygen to the brain can lead to loss of consciousness and death. Victims who are rescued from oxygen deprivation of less than four minutes can still suffer a wide range of serious injuries and lasting neurological

issues, including delays to reach milestones, paralysis, sensory disturbances, seizures, cognitive and memory deficits, and neuropsychological problems.[26-29] Patients who survive cardiac arrest can remain in a coma for various periods and some may remain in a persistent vegetative state. Patients who survive prolonged anoxic episodes require a multidisciplinary rehabilitation that may include speech therapy, physical therapy, and/or prolonged specialized care inside or outside of the home, with the level of care dependent on the severity of the injury.

III. Conclusion

HS Staff reviewed petitions CP 22-1 and CP 22-2 and assessed the subject hazard, which included a review of fatal and nonfatal incidents relevant to the petition and a discussion of the most current medical literature pertaining to the pathophysiology of positional asphyxia and the mechanisms and severity of injury associated with both wedging and entrapment due to sidewall gaps in mattresses and the addition of soft bedding to infant sleep setting. The current play yard regulation (16 CFR part 1221) provides a safe sleep environment for infants in line with recommendations from the American Academy of Pediatrics (AAP). Infants should be placed to sleep in a supine position on a firm, flat, level surface without soft bedding in the sleep setting. HS staff recognizes the hazard to infants from soft bedding placed in play yards and gap entrapments in play yards due to ill-fitting mattresses. Most infant deaths in play yards are attributed to suffocation in an unsafe sleep setting. This includes a crowded sleep area that may contain soft bedding such as adult pillows, infant pillows, comforters, quilts, blankets, and foam pads. Additionally, caregivers may place multiple mattresses within the sleep setting or thick mattresses, which raises the level of the sleeping surface and can pose additional risks by increasing the chances to form a large gap between the mattress and sidewall of the play yard where an infant can roll into and become wedged. Infants under 12 months of age are at high risk from positional asphyxia, but infants two to six months of age may be at particular risk because they may be developmentally capable of moving around in the sleep environment and moving into a vulnerable situation, such as getting wedged in a gap, but not yet have the physical capability to extricate themselves from a hazardous situation.

References

1. Data from NEISS are based on a nationally representative probability sample of about 100 hospitals in the United States and its territories. The NEISS reports capture one part of the treatment process (the emergency department visit), and typically do not show information on treatment after the initial visit.
2. CPSRMS is the epidemiological database that houses all anecdotal reports of incidents received by CPSC, “external cause”-based death certificates purchased by CPSC, all in-depth investigations of these anecdotal reports, as well as investigations of select NEISS injuries. Examples of documents in CPSRMS include the following: hotline reports, Internet reports, news reports, medical examiner’s reports, death certificates, retailer/manufacturer reports, and documents sent by state/local authorities, among others.
3. Suchy, A. Tab C, Epidemiology Memorandum. Staffing Briefing Package Petitions CP 22-1 & CP 22-2: Petitions Requesting Rulemaking on Play Yard Mattress Thickness and Standardizing Size of Play Yards. Bethesda, MD: Office of Hazard Identification and Reduction, U.S. Consumer Product Safety Commission, 2023.
4. Harsanyi, S. Tab D, Human Factors Memorandum. Staffing Briefing Package Petitions CP 22-1 & CP 22-2: Petitions Requesting Rulemaking on Play Yard Mattress Thickness and Standardizing Size of Play Yards. Bethesda, MD: Office of Hazard Identification and Reduction, U.S. Consumer Product Safety Commission, 2023.

5. Chmieliauskas S, Mundinas E, Fomin D, Andriuskeviciute G, Laima S, Jurolaic E, Stasiuniene J, Jasulaitis A. Sudden deaths from positional asphyxia: A case report. Medicine (Baltimore). 2018 Jun;97(24):e11041. doi: 10.1097/MD.0000000000011041. PMID: 29901602; PMCID: PMC6023692.
6. Gordon I, Shapiro HA. Deaths usually initiated by hypoxia or anoxic anoxia. In: Gordon I, Shapiro HA, editors. Forensic medicine: 2nd ed. Edinburgh, UK: Churchill Livingstone, 1982; 95–129
7. Gordon I. The medicolegal aspects of rapid deaths initiated by hypoxia and anoxia. Leg Med Annu. 1975:29-47. PMID: 768671.
8. Polson CJ. Hanging In: Polson CJ and Gee DJ (eds.) Essentials of forensic medicine Oxford England, 1973 371-404.
9. Spitz WU. Asphyxia. In: Spitz WU, Spitz DJ, editors. Spitz and Fisher's medico-legal investigation of death: guidelines for the application of pathology to crime investigation, 4th edn.
10. Wanna-Nakamura S. White Paper – Unsafe Sleep Settings: Hazards associated with the infant sleep environment and unsafe practices used by caregivers: a CPSC staff perspective.
11. Gilbert-Barnes, E, Hegstrand L Chandra S, Emery J, Barnes LA, Franciosi R, and Huntington R. Hazards of mattresses, bed and bedding in deaths of infants. Amer J Forensic Med and Pathol 1991; 12(1):27-32.
12. Hauck FR, Herman SM, Donovan M, et al. "Sleep Environment and the Risk of Sudden Infant Death Syndrome in an Urban Population: The Chicago Infant Mortality Study." Pediatrics 2003; (111): 1207-1214
13. Byard RW, Beal S and Bourne AJ. Potentially dangerous sleeping environment and accidental asphyxia in infancy and early childhood. Arch Dis Child 1994; 71: 497-500.
14. Fleming PJ, Blair PS, Bacon C, et al. Environment of infants during sleep and risk of the sudden infant death syndrome: results of 1993-5 case-control study for confidential inquiry into stillbirths and deaths in infancy. BMJ. 1996;313:191-195
15. Gioia S, Franceschetto L, Carlini L, Suadoni F, Lancia M. A case of a head-down position death in a six-months old baby with concurrent pneumonia. Forensic Science International: Reports, Volume 2, 2020, 100045, ISSN 2665-9107, https://doi.org/10.1016/j.fsir.2019.100045.
16. Matshes EW, Lew EO. An Approach to the Classification of Apparent Asphyxial Infant Deaths. Acad Forensic Pathol. 2017 Jun;7(2):200-211. doi: 10.23907/2017.021. Epub 2017 Jun 1. PMID: 31239974; PMCID: PMC6474537.
17. Alston, M. L., et al. (2021). J Pub Health Issue Pract, 5(2): 186 https://doi.org/10.33790/jphip1100186
18. Camps FE and Hunt AC. Pressure on the neck. J Forensic Med 6:116, 1959.
19. Iserson, K.V. Strangulation: A review of ligature, manual and postural neck compression injuries. Ann. Emerg. Med. 13:179185, 1984.
20. Combrinck M, Byard RW. Infant asphyxia, soft mattresses, and the "trough" effect. Am J Forensic Med Pathol. 2011 Sep;32(3):213-4. doi: 10.1097/PAF.0b013e31822abf68. PMID: 21817867.
21. Moon RY, Carlin RF, Hand I. The Task Force on Sudden Infant Death Syndome and the Committee on Fetus and Newborn; Evidence Base for 2022 Updated Recommendations for a Safe Infant Sleeping Environment to Reduce the Risk of Sleep-Related Infant Deaths. Pediatrics July 2022; 150 (1): e2022057991. 10.1542/peds.2022-057991
22. Task Force on Infant Positioning and SIDS. Positioning and infant death syndrome (SIDS): update Arch Pediatr Adolesc Med. 1996;150:834-837

23. Dwyer T, Ponsonby A-L, Blizzard L, Newman NM, Cochane JA. The contribution of changes in prevalence of prone sleeping position to the decline in sudden infant death syndrome in Tasmania. JAMA. 1995;273:783-789
24. Ponsonby AL, Dwyer T, Gibbons LE, Cochrane JA, Wang Y-G. Factors potentiating the risk of sudden infant death syndrome associated with prone position. N Engl J Med. 1993;329:377-382
25. Smialek, JE, Smialek, PZ and Spitz, WU. Accidental bed deaths in infants due to unsafe sleeping situations. Clinical Pediatrics 1977; 15 (11):1031-1035
26. Medalia AA, Merriam AE, Ehrenreich JH. The neuropsychological sequelae of attempted hanging. J Neurol Neurosurg Psychiatry. 1991; 54:546–8.
27. van Handel, M., Swaab, H., de Vries, L.S. *et al.* Long-term cognitive and behavioral consequences of neonatal encephalopathy following perinatal asphyxia: a review. *Eur J Pediatr* **166**, 645–654 (2007). https://doi.org/10.1007/s00431-007-0437-8
28. Dzikienė R, Lukoševičius S, Laurynaitienė J, Marmienė V, Nedzelskienė I, Tamelienė R, Rimdeikienė I, Kudrevičienė A. Long-Term Outcomes of Perinatal Hypoxia and Asphyxia at an Early School Age. Medicina (Kaunas). 2021 Sep 18;57(9):988. doi: 10.3390/medicina57090988. PMID: 34577911; PMCID: PMC8466311.
29. Jongewaard WR, Cogbill TH, Landercasper J. Neurologic consequences of traumatic asphyxia. J Trauma. 1992 Jan;32(1):28-31. doi: 10.1097/00005373-199201000-00006. PMID: 1732570.

Tab F: Mechanical Engineering Assessment for Petition CP 22-1 & CP 22-2

United States
Consumer Product Safety Commission

Memorandum

Date: March 29, 2023

TO: Frederick DeGrano, Mechanical Engineer
Division of Mechanical and Combustion Engineering
Directorate for Engineering Sciences

THROUGH: Caroleene Paul, Director
Division of Mechanical and Combustion Engineering

FROM: Carlos Torres, Mechanical Engineer
Division of Mechanical and Combustion Engineering
Directorate for Engineering Sciences

SUBJECT: Mechanical Engineering Assessment for Petition CP 22-1 & CP 22-2, Petitions Requesting Minimum Thickness for Play Yard Mattresses and Standardizing the Size of Play Yards and Play Yard Mattresses

I. Introduction/Background

This memorandum provides Consumer Product Safety Commission (CPSC) Engineering Sciences Division of Mechanical and Combustion Engineering (ESMC) staff's assessment of the petitioners' requests for CPSC to amend mandatory rules for play yards.

A. Regulations and Voluntary Standards

CPSC's rule *Safety Standard for Play Yards*,16 C.F.R. part 1221[83], (the play yard rule), incorporates by reference with modifications the voluntary standard ASTM F406-19, *Standard Consumer Safety Specification for Non-Full-Size Baby Cribs/Play Yards*. The play yard rule specifies requirements stating that all play yards shall be sold with a mattress included and shall have a total thickness of no more than 1.5 inches with a maximum of 1 inch of filling material, such as foam or fiberfill. Play yard mattresses sold with the play yard are referred to as original equipment manufacturer play yard mattresses, or OEM play yard mattresses. OEM play yard mattresses do not have horizontal dimensional requirements, and there is no requirement restricting the size of sidewall gaps between the play yard mattress and the sidewalls of the play yard. As ESHF staff assesses (Tab D), infants in the intended age group are unlikely to suffocate in a sidewall gap produced by a compliant mattress, because the thin mattress does not allow a pocket deep enough to form between the mattress and sidewall that can fully entrap a small infant's arm.

[83] United States, Consumer Product Safety Commission. "Revisions to Safety Standards for Non-Full-Size Baby Cribs and Play Yards." 84 FR 56684

The CPSC also published the *Safety Standard for Crib Mattresses*, 16 C.F.R. part 1241[84], (the crib mattress rule), which incorporates by reference with modifications the voluntary standard ASTM F2933-21, *Standard Consumer Safety Specification for Crib Mattresses*. The crib mattress rule contains requirements for after-market mattresses intended to be used as a replacement for an OEM play yard mattress. Among other requirements pertaining to after-market mattresses, the crib mattress rule specifies the following: (1) a requirement to test to specific sections of the play yard rule, (2) a requirement that the after-market mattress must be at least the same size as the original equipment mattress, so long as it lays flat on the support structure; and (3) a requirement that the after-market mattress floor support structure be at least as thick as the original equipment mattress floor support structure. These requirements allow after-market play yard mattresses that may be thicker than what is provided by the original equipment manufacturer, but still limit such mattresses to the maximum thickness specified in ASTM F406 – 19 (*i.e.,* 1½ inches). Additionally, the crib mattress rule requires a mattress firmness test for after-market mattresses which intends to reduce the risk of infant suffocation associated with mattress surfaces that are overly soft and conform to an infant's face.

Tab D details the marking and labeling requirements for the above mandatory and voluntary standards.

II. Discussion

A. Petition CP 22-1 – Mattress Thickness Petition

1. Petition Summary

Petition CP 22-1, titled *Petition to Require Minimum Thickness for Play Yard Mattresses*, requests that the CPSC amend the mandatory play yards rule to require a minimum thickness of 1.5 inches with "minimal" tolerance and a maximum thickness of 3 inches for play yard mattresses. The petitioners allege that manufacturers often design their play yards to include mattresses that are less than the 1.5-inch requirement to account for manufacturing tolerances and avoid non-compliance. They claim that this often leads to mattresses with only 0.5 inches of filling material on top of rigid structural layers and thus consumers perceiving OEM mattresses as uncomfortable for infants, resulting in consumers adding soft bedding under their infants and creating a hazardous sleep environment. The petitioners also propose for mattresses over 1.5 inches thick, to limit the gap between the mattress and the sidewall to no more than 0.5 inches by taking a measurement of the gap. Petitioners claim that this gap size effectively prevents infants from becoming entrapped.

2. Background

The ASTM F406 standard, originally adopted in 1981, required a maximum mattress/pad thickness of 1 inch for play yards. ASTM added this new requirement in response to asphyxiation deaths received by the CPSC in which the victims were left to sleep in mesh sided

[84] United States, Consumer Product Safety Commission. "Safety Standard for Crib Mattresses." 87 FR 8640

play yards and one of the sides was left unlocked leading to a loose mesh sidewall.[85] In 1999, the requirement was increased to 1.5 inches to include structural layers in the mattress pad such as wood, hardboard, etc. Based on the incident data, staff advises that the limitation on mattress thickness to 1.5 inches reduces the likelihood of an infant becoming wedged and entrapped in the gap between the mattress and the mesh sidewall of the play yard. ASTM F406 does not include this type of limitation on mattress thickness for non-full-size (NFS) baby cribs because the rigid sides prevent a gap that is limited to no more than 0.5 inches from expanding and becoming an entrapment hazard.

On January 13, 2022, ASTM balloted a proposal similar to the petitioners' requests to increase the maximum thickness of play yard mattresses from 1.5 inches to 2 inches and to limit the gap between the mattress and the play yard side to no more than 0.5 inches. In response, CPSC staff voted negative and sent a letter[86] (dated February 11, 2022) to the ASTM F15.18 Subcommittee on Play Yards and Non-Full-Size Cribs expressing staff's concerns that the proposal did not ensure a play yard's mesh sidewall was stiff enough to prevent the formation of a hazardous pocket between the sidewall and mattress if the mattress is over 1.5 inches thick. Specifically, the balloted proposal did not require a force to be applied to the play yard's flexible sidewall to mimic an infant rolling into the side of the play yard. Therefore, staff determined the proposal did not address flexible sidewalls that will stretch and potentially form a hazardous pocket due to the weight of an infant against the sidewall. As discussed above, the 1.5-inch mattress thickness requirement minimizes the depth of a pocket that can form between the mattress and mesh sidewalls.

Staff concluded that the balloted proposal did not specify requirements for minimum tautness of mesh/fabric sides. Therefore, it is possible for products to meet the requirements of the balloted standard, yet still be designed with less taut mesh sidewalls to form hazardous gaps due to outward deflection with an applied force (such as an infant leaning against the sidewall). The requirement to limit the gap between the mattress and sidewall to no more than 0.5 inches currently applies to baby cribs with rigid sides, but because play yards have flexible sides, a gap of 0.5 inches will expand when a lateral force is applied to the sidewall.

On March 7, 2022, CPSC staff sent a follow-up letter[87] to the ASTM subcommittee with staff's proposed test method to apply force to the play yard sidewall when measuring the gap between the mattress and sidewall, recommending that the gap between the mattress and sidewall must remain 0.5 inches or below while this outward force is applied with the mattress centered.

On May 25, 2022, the subcommittee did not accept or even discuss staff's recommended test protocol. The subcommittee found staff's negative vote non-persuasive and voted to approve and publish ASTM F406-22 as balloted. The new revision of the voluntary standard, ASTM F406-22, includes the requirement for mattresses with thickness greater than 1.5 inches and up

[85] United States, Consumer Product Safety Commission. "Regulation of Certain Mesh-sided Play Yards and Cribs Under Consumer Product Safety Act." 48 FR 34018 (July 27, 1983).
[86] https://www.cpsc.gov/s3fs-public/220211-NFC-Play-yard-ballot-F15-22-01.pdf?VersionId=gjeDrEwJjNq3vevKCFziBdURk2C5yE1K
[87] https://www.cpsc.gov/s3fs-public/CPSC-Proposed-Test-Method-for-F406-19-Revisions-Mar-7-2022.pdf?VersionId=JfL8XDdMdaOWlQjFj6E68Dm3X5HuxeQf

to 2 inches. Staff's evaluation of the changes incorporated in this new revision can be found in staff's PL 112-28 briefing package.[88] On February 22, 2023, the Commission voted unanimously (4-0) to not accept ASTM F406-22 as the new mandatory standard for play yards.[89]

3. Laboratory Testing – Flexible Sidewalls

Staff tested various play yard samples to evaluate the amount of outward deflection the mesh sidewalls will experience with an applied force. Using calculations for the side force generated by large 3-to-5-month-old infants leaning against the play yard's sidewall and empirical measurements generated by leaning a CRABI dummy against a vertical wall with a load cell, staff determined that 5 pounds is an appropriate lateral force to apply to the play yard side to determine the maximum gap measurement (see Figure 1). Assuming a rigid infant body, staff calculated the maximum horizontal component of a 95th percentile 3-5-month-old male weighing 20.2 lb. at a 45-degree lean is 5.05 pounds. Staff placed a CRABI[90] dummy (17.2-pound weight), representing 50th percentile 6-month-old male, in various positions against a vertical force plate to measure the lateral loads produced by the dummy against a sidewall and the highest force measured was approximately 4.35 pounds. Extrapolating this measured force to a 95th percentile 3–5-month-old weighing 20.2 pounds results in approximately 5.11 pounds.

Figure 1. CRABI dummy positioned in play yard (left); CRABI dummy on loadcell test rig (right).

[88] Commission Briefing Package: ASTM's Notice of a Revised Voluntary Standard for Play Yards – Feb 2023: https://cpsc.gov/s3fs-public/ASTMs-Notice-of-a-Revised-Voluntary-Standard-for-Play-Yards.pdf?VersionId=ogcqd17VstU50PjFj_jXZkfJ67ZI4tki

[89] Record of Commission Action – ASTM's Notice of a Revised Voluntary Standard for Play Yards – Feb 2023: https://cpsc.gov/s3fs-public/RCAASTMsNoticeofaRevisedVoluntaryStandardsforPlayYards.pdf?VersionId=UrH80dJb8mmt8PXXzLLDP28zzQ4L2DIe

[90] The CRABI (Child Restraint Airbag Interaction) Child Anthropomorphic Test Devices (ATD) are commonly known as crash test dummies and were developed to evaluate child restraint systems in automotive crash testing. In 1990 the Society of Automotive Engineers (SAE) Mechanical Human Simulation Subcommittee formed the Infant Dummy Task Group. The group developed design specifications for three sizes of infant dummies: a 6-month-old, 12-month-old, and 18-month-old. The group approved the weight distribution and scaling methods.

Using the sliding gauge proposed in CPSC's follow-up letter, as shown below in Figure 2, staff applied a 5-pound force on four play yard samples at various heights above the floor representing various thicknesses of play yard mattresses. Table 1 below describes the resulting gaps between the mattress and sidewall with 5-pound force application for each play yard sample. Staff measured the gap at the midpoint of each side of the play yard sample, labeled head, toe, right, and left, where head and toe are the short sides of the rectangular play yard samples. Staff repeated each measurement three times and averaged them in the table below. Staff found that the resulting gap measured between 1.77 and 2.83 inches when tested 2 inches above the play yard floor and found that the gap increased when the force was applied 3 inches above the play yard floor. This demonstrates that a realistic force from a 5-month-old infant leaning longitudinally against the mesh sidewall can expand the gap between the mattress and sidewall significantly more than the 0.5-inch gap requirement. The looser the play yard mesh, the larger the potential side gap when an appropriate force is applied. Moreover, these data demonstrate that the flexibility of play yard mesh sidewalls varies inconsistently within a product and by product, and typically the flexibility increases as you move up the side of the play yard wall. Although this 0.5-inch gap requirement is the same as the requirement for rigid-sided NFS baby cribs, these data show this requirement does not afford the same level of safety with play yards that have flexible mesh sidewalls.

Figure 2. Force application using CPSC's proposed sliding gauge to measure the gap between the mattress and sidewall (left); gap becomes larger with force applied higher above play yard floor (right)

Table 1. Play yard sidewall deflection data

Play Yard Sample	Wall	Average Gap w/o Force Applied	Average Gap Measurement with 5-lb. Force (inches)		
			1.5" Above Floor	2" Above Floor	3" Above Floor
A	Head	0.375	1.77	2.54	2.83
	Left	0.345	1.54	2.00	2.21
	Right	0.315	1.48	1.94	2.17
	Toe	0.470	1.73	2.48	2.90
B	Head	0.310	2.02	2.58	2.63
	Left	0.250	1.29	1.77	1.75
	Right	0.250	1.40	2.00	1.85
	Toe	0.310	1.83	2.23	2.21
C	Head	0.280	1.65	2.50	2.54
	Left	0.345	1.63	2.02	2.04
	Right	0.345	1.60	2.06	2.06
	Toe	0.280	1.77	2.75	2.81
D	Head	0.470	1.71	2.83	2.96
	Left	0.315	1.40	2.02	2.19
	Right	0.375	1.44	1.96	2.29
	Toe	0.405	1.88	2.46	2.52

4. Mattress Firmness

A thicker mattress may increase the likelihood of softer mattresses that may increase the risk of positional asphyxia involving infants suffocating when face down in a soft mattress that can conform to the infant's face. Additionally, softer mattresses may also deflect inward from the sides as a result of an infant rolling into a sidewall, increasing the potential gap created by the flexible sidewall, thereby exacerbating gap entrapment. The mandatory crib mattress rule requires a firmness test intended to prevent the hazard of positional asphyxia involving infants suffocating when face down in a soft mattress that can conform to an infant's face. However, while this firmness test applies to after-market play yard mattresses, OEM mattresses that come included with play yards are not subject to the firmness test because 16 CFR 1241 does not include OEM play yard mattresses within scope, only after-market play yard mattresses.

The firmness test involves placing a test fixture, as shown below in Figure 3, level on the sleep surface of the mattress. The mattress must be sufficiently firm to support the weight of the test fixture (approximately 11.5 lb.) so that the feeler arm does not make any contact with the surface of the mattress. Based on the incident data detailed in staff's briefing package for the crib mattress final rule,[91] staff identified 55 incidents involving mattresses that were reportedly too soft often leading to depressions, between January 1, 2010, and March 31, 2020. This data

[91] Commission Briefing Package: Final Rule - Safety Standard for Crib Mattresses: https://cpsc.gov/s3fs-public/Final-Rule-Safety-Standard-for-Crib-Mattresses.pdf?VersionId=62bEXbfu7.mIoiiLfn_fbMWtFnEsgGON.

included crib mattresses as well as after-market play yard mattresses which, before the crib mattress rule became effective, were typically thicker than current OEM play yard mattresses. Because no such requirement exists for OEM mattresses, staff recommends that this firmness test, or an equivalent test, be considered for mattresses included with play yards, especially if the standard allows for mattresses with more than one inch of filling.

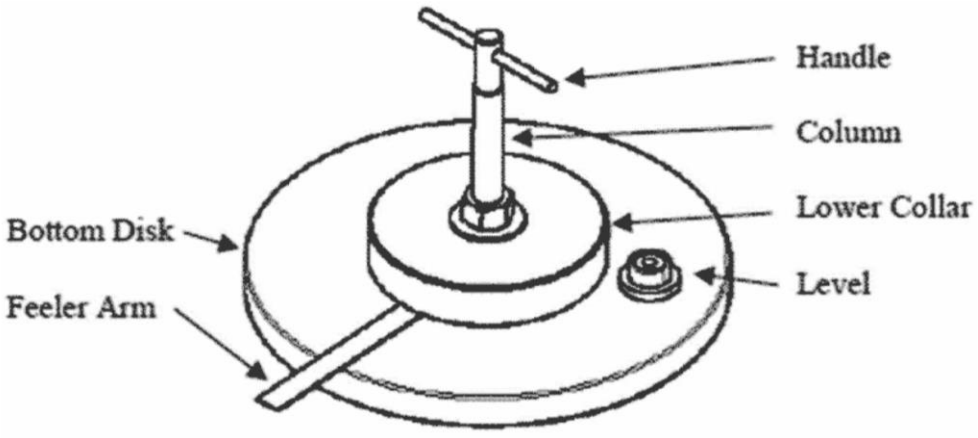


Figure 3. Mattress firmness test fixture

Staff completed testing to assess the safety of mattresses 1.5 inches to 2 inches in thickness in regards to mattress firmness. Staff conducted mattress firmness tests in accordance with the crib mattress mandatory standard (16 CFR part 1241, § 1241.2(14)(i)) on mattress samples, including OEM mattresses less than 1.5 inches thick and after-market mattress samples 2 inches in thickness (*i.e*., thicker than ASTM 406-19 and CPSC's mandatory crib mattress rule currently allow). Table 3 below summarizes the test results. Staff found that mattresses that comply with the current play yard rule passed the firmness test, whereas mattresses with up to 2 inches of filling material failed. The after-market mattresses consistently failed the firmness test because of a combination of being too soft and lacking a rigid structural layer, and thus, they tended to sag in between the rigid bars supporting the play yard floor. The mattress firmness test apparatus would sink in between these rigid bars, and therefore, fail the test. This creates a hazardous sleep environment, where an infant can become entrapped face-down in these concavities and be unable to extricate themselves, creating the risk of suffocation.

Table 2. Mattress firmness test results.

Mattress	Thickness (inches)		Pass/Fail Firmness Test
A	Filling Material:	0.50	Pass
	Structural:	0.25	
	Total:	0.75	
B	Filling Material:	0.25	Pass
	Structural:	0.25	
	Total:	0.50	
C	Filling Material:	0.375	Pass
	Structural:	0.375	
	Total:	0.75	
D	Filling Material:	1.875	Fail
	Structural:	0	
	Total:	1.875	
E	Filling Material:	1.875	Fail
	Structural:	0	
	Total:	1.875	
F	Filling Material:	2.0	Fail
	Structural:	0	
	Total:	2.0	

5. Staff Assessment

Staff concludes that the requirements proposed by the petitioners to allow for play yard mattresses that are thicker than 1.5 inches and as much as 3 inches thick, without a restriction on padding thickness, would reduce safety. Thicker mattresses increase the risk for gap entrapment and the proposed requirements do not account for flexible sidewalls where hazardous gaps may form when an infant leans into the sidewall. Additionally, as noted in Tab D and in public comments, the hazard pattern of adding soft bedding is also present for cribs with mattresses typically 3-6 inches thick, thus staff lack evidence to suggest that requiring thicker mattresses would reduce the risk of caregivers adding soft bedding. Staff recommends that the Commission deny petition CP 22-1.

B. Petition CP 22-2 – Standardized Size Petition

1. Petition Summary

Petition CP 22-2, titled *Petition to Standardize the Size of Play Yards and Play Yard Mattresses*, requests that the CPSC amend the mandatory rule for play yards to standardize the interior size of play yards and play yard mattresses. The petitioners reference a precedence for standardizing the size of an infant sleep product when the original requirements for full-size baby cribs was established in 1973. They argue that the same rationale for standardizing cribs to "provide uniformity of size for consumers who must purchase accessories, including properly

fitting mattresses, which contribute to the crib's safety aspects" applies to play yards as well. The petitioners assert that because play yard products in the market contain a variety of shapes and sizes, consumers often mistakenly purchase after-market mattresses that are inappropriately sized for their play yard resulting in a fatality. Therefore, the petitioners conclude that establishing standard sizes for each play yard perimeter shape would simplify purchasing a properly fitting mattress for their play yards without the need to measure the interior dimensions of their play yards and comparing to available products in the market.

2. Mattress Compatibility

Although the petitioners assert that establishing a standardized size for play yards will simplify consumers' mattress purchasing experience for their play yards, the petitioners' proposal does not take into account how play yard products variability other than their size affect the compatibility of after-market play yard mattresses. The crib mattress rule requires all after-market mattresses to be tested with the brand(s) and model(s) of play yards for which they are intended to replace the mattress as well as requiring labeling on the mattress that specifically identifies those brand(s) and model(s). Testing the mattress with the play yard brand(s) and model(s) and identifying those brand(s) and model(s) that are compatible addresses a range of issues including fit and the effects of support structures and attachment means. The crib mattress rule requires all after-market play yard mattresses to meet the following sections of the mandatory play yard rule: Stability; Cord/Strap Length; Mattress; Height of Sides; Floor Strength; Mattress Vertical Displacement. In addition to these sections, the crib mattress rule adds a mattress firmness requirement.

The crib mattress rule requirements, which became effective August 15, 2022, addresses more characteristics of after-market mattresses than just the horizontal dimensions and will ensure compatibility with the specific play yard with which each mattress is intended to be used. Below describes two additional characteristics: mattress attachment and structural compatibility.

Between January 1, 2010, and July 31, 2022, staff identified 42 incident reports[92] involving entrapment underneath a play yard mattress due to the mattress being moved and shifted, one of which resulted in a fatality. The most common reason the mattress was able to be displaced was because it was not properly secured down to the floor of the play yard. The play yard rule addresses this hazard scenario by requiring that mattresses be secured to the bottom of the play yard to prevent infants from maneuvering underneath the mattress and becoming entrapped. The crib mattress rule also requires after-market mattresses to meet this same requirement, called the mattress vertical displacement requirement. Manufacturers have developed numerous ways to secure the mattress to the floor, which differs between play yard model designs. For example, some products meet the requirement by using straps attached to the bottom of the mattress that extend through a hole of the fabric play yard floor and attach to the rigid mattress support frame below. For this type of securement mechanism, products often use different fastening mechanisms such as hook and loop, button snaps, buckles, etc. Also,

[92] Incident data detailed in Tab C

the location of the straps often varies from product to product depending on the rigid frame structure of the particular play yard model.

3. Staff Assessment

The petitioners' notion of a 'one size fits all' mattress for standard size play yards may decrease safety. Mattress fit is an important part of safety, but all play yard mattresses, whether provided originally with the play yard or purchased after-market, must also be compatible with the product in terms of floor attachment and structural compatibility. Therefore, staff finds that the existing crib mattress rule addresses the risks related to fit that the petitioners seek to address through standardizing sizes, thus staff lack data to justify a standardized size.

III. Conclusion

ESMC staff concludes that the requirements proposed by petition CP 22-1 to allow for mattresses thicker than 1.5 inches with an undeflected gap limitation of no more than 0.5 inches would reduce safety because hazardous gaps may form when an infant leans into the sidewall and can become entrapped. ESMC staff further concludes that the requirements proposed by petition CP 22-2 to standardize the size of play yards and play yard mattresses is not reasonably necessary because the petitioners' concern solely for the horizontal dimensions of play yard mattresses is already addressed by the crib mattress rule.

ESMC staff reviewed petitions CP 22-1 and CP 22-2 and assessed the subject hazards, regulations, and voluntary standards. While ESMC staff shares the petitioners' concerns regarding hazardous gaps and ill-fitting mattresses in play yards, ESMC staff concludes that the petitioners' proposed requirements do not effectively address the hazard.

Tab G: Market Analysis for CP 22-1 & CP 22-2

United States
Consumer Product Safety Commission

Memorandum

TO: Frederick DeGrano, Project Manager
Division of Mechanical and Combustion Engineering,
Directorate for Engineering Sciences

DATE: March 29, 2023

THROUGH: Alex Moscoso, Associate Executive Director, and
José Tejeda, Supervisory Economist,
Directorate for Economic Analysis

FROM: Susan Proper
Economist
Directorate for Economic Analysis

SUBJECT: Market Analysis for Two Petitions Requesting that the Commission Undertake Rulemakings to Require (1) Minimum Thickness for Play Yard Mattresses and an Increased Maximum Thickness and (2) Standardize the Size of Play Yards and Play Yard Mattresses

I. Executive Summary/Introduction

This memorandum provides a market analysis for play yards and play yard mattresses, and other economic considerations related to the petitions for a briefing package for the Commission. The briefing package will inform and assist the Commission in their decision whether to grant, deny, or defer action on this petition. The market analysis is based on information provided by the petitioner, readily available market research, and public websites of government agencies and private sector organizations.

Based on this market analysis, the actions proposed by the petitioner could impose substantial costs on the impacted industry, could reduce consumer choice, and could have a disparate negative impact on low-income consumers.

The costs from a potential rule increasing play yard mattress thickness and establishing standard perimeter sizes could be substantial, especially in the first year of the potential rule, as most products currently on the market would not be compliant with the requirements proposed by the petitioners. The costs in subsequent years could also be substantial because the reduction in consumer choice from the standardized size requirement (meaning only one size of rectangular play yard or rectangular mattress would be allowed) could reduce demand for these products.

II. Market – Numbers of Play Yards Sold Annually, Play Yard and Play Yard Mattress Suppliers, and Prices

Overview of Market

Consumers purchase approximately 2.5 million play yards each year; about two thirds of all families with newborns purchase play yards. Staff conducted an internet search of bestselling

play yards on the three largest internet retailers of toys and baby products in the U.S.[93] and calculated an average price of $100 from this convenience sample. Using the estimated units sold each year and average price, staff estimates the total market for play yards is an estimated $250 million per year. Staff could not find enough information on after-market play yard mattresses to determine the number of units sold each year, but it is likely far less than the number of play yards sold each year.

A. Number of Play Yards Sold in the U.S. and Price

Public comments on the *Federal Register* notice for the petitions provided an estimate of total sales of play yards at "over 2.47 million" in 2021.

A survey by Statista[94] in 2017 found that 66 percent of parents with infants up to age 4 owned a play yard. This was higher than the percentage of parents in the same survey who owned a baby/toddler bed (62 percent), bassinet/cradle (38 percent) or a bedside crib/bassinet (29 percent), reflecting that play yards are the most widely owned safe sleep safe product for infants.

Parents with newborns are the target market for play yards. There were 3.66 million babies born in the U.S. in 2021[95] (and 1,785 babies adopted from outside the U.S)[96]. Applying the 66 percent estimate of the share of families who own a play yard from Statista with the number of babies born and adopted from outside the U.S. results in an estimate of approximately 2.42 million units sold per year for the play yard market.[97] This is consistent with the public comments from a manufacturer and the industry trade association that estimated the market to be over 2.47 million units, rounded for this analysis to 2.5 million units.

Prices for play yards range from under $50 to over $350, with most items costing between $70 and $150. Prices vary based on size, features, and brand names. Many play yards, particularly the more expensive ones, are multi-mode products where the play yard has a bassinet attachment or bassinet mode. Other common attachments include toy bars, canopies, and diaper changing pads. Portability is an important and common feature; items throughout the price range fold for transport and/or have wheels. Some products are marketed only for play and do not come with any mattress. Items advertised as compliant with the current CPSC play yard standard are often marketed as "mini-cribs" or "portable cribs". Rectangle is by far the most common shape for play yards, with square, hexagon, and octagon also available. While the petitioner specifically mentioned round and oval shapes, these are extremely uncommon. Some rectangular shaped play yards do have slightly rounded corners. With sales estimated at about 2.5 million units per year, and an estimated average price of $100, the total market for play yards is approximately $250 million per year.

Play yards compete with other infant sleep products such as cribs, bassinets, cradles, and bedside sleepers, although none of those products are also designed for play. Over the past decade, play yards have gained market share over these other products, particularly full-size cribs, in part because of the wide variety of play yard shapes, sizes, and features available at a

[93] https://www.statista.com/study/57590/ecommercedb-top-online-stores-in-the-united-states/
[94] https://www.statista.com/forecasts/987681/ownership-of-baby-furniture-in-the-us
[95] https://www.cdc.gov/nchs/nvss/births.htm
[96] https://travel.state.gov/content/travel/en/Intercountry-Adoption/adopt_ref/AnnualReports.html
[97] This estimate may be higher than the actual number of new products sold. It does not include sales of used products, or sales to hotels and daycare facilities.

range of prices. Also, as public commenters noted, many families buy these products primarily as play spaces, but use them as safe sleep spaces for travel and other occasional use. Play-yards advertised as compliant with current CPSC mandatory safety regulations are widely available, usually less expensive, more portable, and take up less floor space than a full-size crib. In the recent (2020) Regulatory Flexibility Act 10-year retrospective review of the market impact of CPSC's crib regulations,[98] several crib manufacturers noted that cribs have lost market share to play yards, and that they had switched their product line to these cheaper and more portable safe sleep spaces. Small, foldable play yards are often the least expensive safe sleep space for a child up to 35 inches tall, which is the 95th percentile height for an 18-month-old male[99] (small bassinets can be cheaper than play yards, but the marketed age for a bassinet is typically 5 months or less). Charitable organizations that formerly provided free traditional full-size cribs to low-income families now typically offer folding play yards instead,[100] based on both cost and customer preferences.

Play yards are sold in a range of sizes, even from the same manufacturer, reflecting both that the market for play yards is large, and that different consumers demand different features at different price points. For example, a single large manufacturer of play yards has more than 30 different models of play yards currently available, with list prices ranging from $70 to $360. This supplier sells rectangular play yards, in over 20 different sizes and square and hexagonal play yards.[101] The least expensive model folds and has wheels, but has no attachments, while the most expensive model has multiple attachments. Additional specialized features include play yards for twins, diaper changing pads, bassinets, canopies, and toy bars. Several other large suppliers have a similarly wide range of play yard products to meet the needs of different consumers.

The bestselling products on websites from the three largest retailers of baby products and toys in the U.S. reflect the wide range of consumer demand for different prices and features. Play yards do not have one bestselling set of features or size, nor are the bestselling play yards available in a narrow price range. On a major online general retailer site, the top 10 bestselling play yards in February 2023 ranged in price from $47 to $220, and included rectangular, square, and hexagonal products. Some of the most popular products had no attachments and no wheels, while others had wheels and two or more features such as bassinets or diaper changing pads. Some products were advertised only for play and did not come with a mattress. At a general "big box" retailer that is a major seller of baby products, the top ten bestselling play yards ranged in price from $40 to $156, with a similar diversity of features, and included rectangular and square products and products sold without a mattress. Top ten bestsellers at a third "big box" retailer ranged in price from $56 to $220 and included rectangular and hexagonal products with a range of features, as well as products sold without a mattress.

B. After-market Play Yard Mattress Market

The petitioners did not provide specific data on the number of after-market play yard mattresses sold each year that they consider to be within scope of the petition. Petitioners stated that

[98] https://www.cpsc.gov/content/Full-Size-Cribs-and-Non-Full-Size-Cribs-Standards-Rule-Review-Final-Contractor-Technical-Report
[99] https://www.cdc.gov/growthcharts/data/set1/chart05.pdf
[100] https://cribsforkids.org/, Cradle of Hope
[101] While the sizes have a relatively narrow range, a difference of half an inch in either dimension between two models could require a different mattress specific to each model to meet the current play yard standard.

millions of after-market (formerly called “supplemental”) play yard mattress that are two or three inches thick have been sold over the past decade.

Staff was unable to estimate the number of play yard mattresses that are sold each year separately from the play yard given the current and readily available information. In the recent final rule for crib mattresses briefing package,[102] staff estimated that 75 percent of the after-market crib mattresses for sale in the U.S. in 2021 were full-size crib mattresses, with the remaining 25 percent including not full-size crib mattresses as well as play yard mattresses Several of the incidents in Tab C involved a crib mattress inside a play yard. In addition, play yard mattresses are often marketed for use outside the play yard, as activity mats, sleeping pads, or for use inside an enclosure. Items that appear identical to play yard mattresses are marketed as mini-crib mattresses, play yard “mats”, and “mattress toppers.” Given the vagueness of categories of after-market play yard mattresses, staff was unable to estimate how many play yard mattresses sold each year are purchased for use inside the play yard and would be in scope of the petitioner’s requested action.

Products marketed specifically as play yard mattresses range in price from about $30 to over $75, with most products sold by after-market suppliers, rather than the original play yard manufacturer. Staff assumed that the various items marketed as play yard “mattress toppers”, “playpen mats” and “mattress pad protectors” are out of scope because they are not marketed as mattresses. Similarly, staff considered products marketed as “mini crib” or “portable crib” mattresses to be out of scope. There are relatively few products advertised specifically as play yard mattresses in February 2023. Staff found fewer than 10 U.S.-based manufacturers and importers in this market, with most of the suppliers being foreign direct shippers. The selection of play yard mattresses is currently much smaller than the selection of available play yards; one of the largest U.S. retailers of baby products sells hundreds of different play yards, but fewer than ten models of play yard mattresses.

The sizes for sale are mostly advertised in whole inches, rather than fractions, and the claims of compatibility with a particular brand of play yard may not be accurate. For example, most mattresses claim to be compatible with a brand name that includes play yards of more than a dozen different sizes, and many claim to be compatible with “most” play yards or “standard” play yards. Thus, the petitioner’s statement that consumers may “inadvertently purchase the wrong size” appears plausible at the time the petition was submitted. However, the recent crib mattress rule,[103] which requires manufacturers to specify which models the crib or play yard mattress is intended for, may address this issue fully for mattresses manufactured or imported after August 15, 2022 (see, e.g., Tab D Human Factors assessment in this briefing package)

Play yard mattresses vary in meaningful attributes beyond their horizontal dimensions, such as structural supports and means of securing the mattresses to the play yards. Thus, even if a consumer finds an after-market mattress that appears to be the same dimension as the mattress that came with the play yard, that mattress may not fasten correctly and safely to the bottom of the play yard.

[102] https://www.cpsc.gov/s3fs-public/Final-Rule-Safety-Standard-for-Crib-Mattresses.pdf?VersionId=62bEXbfu7.mIoiiLfn_fbMWtFnEsgGON
[103] Safety Standard for Crib Mattresses (2022): https://www.federalregister.gov/documents/2022/02/15/2022-02414/safety-standard-for-crib-mattresses

Replacement mattresses from the original play yard supplier are often not available. Several major suppliers do not sell replacement mattresses for their play yards. Other OEMs sell replacement mattresses for a few bestselling products currently on the market, but not for all of their products currently or formerly available. Third party sellers on internet marketplaces often sell discontinued (but not recalled) and overstock play yards from major manufacturers. Given the limited market for after-market play yard mattresses, consumers are often unable to purchase a replacement mattress from the OEM for their play yard.

C. Entities in Scope of the Proposed Action

More than 100 suppliers sell play yards to the U.S. market, and a few dozen suppliers sell play yard mattresses. The market for play yards includes several large publicly traded companies based in the U.S. and Canada, as well as dozens of small U.S. manufacturers and importers. Most play yard mattress suppliers are foreign direct shippers. Most of the U.S. suppliers for both play yards and mattresses markets are small, using the relevant Small Business Administration (SBA) size standards for manufacturers and importers. The number of suppliers is an approximation because there are a large number of foreign direct shippers and small importers in the market. These types of suppliers typically sell a broad mix of consumer items and can quickly enter or exit the market for a particular type of product such as play yards or play yard mattresses.

III. Costs and Other Impacts to Suppliers, Including Small Businesses

The cost to suppliers, large and small, for implementing the proposed actions requested by petitioners could be significant. Nearly every product on the market would require redesign and many products would have to be removed from the marketplace altogether.

For the petition regarding mattress thickness, any current play yard with a mattress less than 1.5 inches thick, which the petitioner believes is common, would become not compliant. After-market mattresses would similarly be noncompliant if they are less than 1.5 inches thick or more than 3 inches thick. Thicker mattresses would likely cost more to produce and to ship, as several public commenters noted, resulting in higher costs to businesses that would have to be either absorbed (reducing profit) or passed onto consumers in the form of higher prices. All mattresses that did not meet the requirements would have to be redesigned and third party tested. It is possible that some after-market mattresses could be remarketed as activity mats, but consumer demand for that use might be less.

For the petition regarding standardizing sizes for both play yards and play yard mattresses, many products currently on the market could become noncompliant. Play yards and play yard mattresses currently come in a variety of rectangular sizes; the petition would require that CPSC specify only one size of rectangle for the entire industry. The diversified nature of this market shows that these consumers value choice in size. Given the popularity of many different sizes of rectangular play yards and mattresses, any standardization in size could lead to a significant loss in utility to consumers as their preferred sizes could be eliminated. To use the earlier example, the company with 20 different sizes of rectangular play yards would find that 19 of their sizes are no longer allowed, and would have to redesign 95% of their models, as well as all the packaging and accessories for those models, or stop selling those models. The variety of sizes is not as great for square, hexagon, and octagon products, as these products are less common, but similarly, all but one size of each shape would be noncompliant. Rectangular

products with rounded corners would likely not meet the specified dimensions for rectangular play yards.

Commenters asserted that the redesign of a play yard could take a year or more, during which time the supplier might have few or no products on the market. One commenter estimated that it could take three to five years to completely redesign product lines. Redesign might be challenging for folding designs, which are common, so that they still fold with a thicker mattress. Straps and fasteners that attach the mattress to the play yard floor would have to be redesigned to work with a thicker mattress. All of the redesigned items would have to be third party tested and certified as compliant.

An importer of play yards or mattresses would have to find a compliant supplier before the effective date of any final rule, while all of their competitors are also trying to contract with the same limited set of suppliers. Some importers may not have any product by the effective date, which could cause supply disruptions.

Consumers may react to the narrower types of products from play yards by demanding other sleep and play products with a variety of sizes that better fit their needs. For example, a consumer who wants a specific size of play yard for play only might buy an enclosure without a floor instead of a play yard with a fabric floor. A consumer who wants a different sized rectangular play yard than the allowed size might buy a crib or a toddler bed instead from a different company. Non-full-size (NFS) rigid-sided cribs would not be subject to the proposed size standards, so those products might take the infant sleep product market share from consumers who want to purchase different sizes than the standard play yard sizes. The market for play yards would almost certainly shrink due to reduced demand for standardized products. In the recent (2020) Regulatory Flexibility Act 10-year retrospective review of the market impact of CPSC's crib regulations[104], several crib manufacturers noted that cribs lost market share to other products, including play yards, after the standardized sizes and other requirements removed unusually sized and shaped products from the marketplace, and prevented innovations in design.

The requested actions would also have impacts on the suppliers of other infant sleep products. Many bassinets and bedside sleepers currently on the market are combination products where the infant sleep surface zips out to convert the product into a play yard for larger children. These products come in a variety of sizes. The suppliers of these products would have to redesign their products, usually rectangular, to be the one size allowed for rectangular play yards, redesign them to remove the play yard feature that customers demand, or discontinue selling these products. Even if a rectangular combination product is the permitted size, the mandatory standard for bassinets currently limits mattresses including structural supports and covers to 1.5 inches thick, with only one inch allowed for the mattress filling, so a product that uses the same 1-inch-thick mattress for a bassinet mode and a play yard mode would have to be redesigned. A public commenter noted that if a product comes with two different mattresses, consumers might stack the mattresses. However, this could happen with current combination products.

After-market mattress suppliers could similarly find that most or all their product line is noncompliant. In addition, suppliers that may have just absorbed a one-time cost to comply with

[104] https://www.cpsc.gov/content/Full-Size-Cribs-and-Non-Full-Size-Cribs-Standards-Rule-Review-Final-Contractor-Technical-Report

the recently published *Safety Standard for Crib Mattresses* (16 CFR part 1241), which went into effect on August 15, 2022,[105] could find that all those redesigned products will have to be redesigned again, removed from the market, or remarketed as activity mats. After the cost and effort to comply with the crib mattress rule, including designing mattresses that are the correct size for particular play yards, and updating all the labeling and instructions for more than a dozen models, a small business could find that nearly all of their after-market play yard mattress product line is no longer compliant with the one required size for rectangle.

A. Potential Impact on Small Businesses

As noted earlier, most suppliers in this market are small businesses. The potential impact on small businesses is likely significant and may be sufficient to cause firms to exit the market.[106] Manufacturers and importers with a few models could find their entire product line of play yards or play yard mattresses is noncompliant. Small importers and small manufacturers who design in the U.S. but outsource production overseas could find themselves with no supplier, as the entire play yard industry retools and the factories that make play yards prioritize larger contracts with larger companies. The cost of complying with both the requested actions in the petitions and the recent crib mattress rule may be particularly burdensome for small businesses that are within the scope of the recent crib mattress rule. It could be particularly burdensome for small businesses that have either play yards or play yard mattresses as a significant portion of their product line.

Smaller businesses will be at a disadvantage because they will be less likely than larger businesses to be able to spread the cost of redesign over multiple models or cover the cost of redesigning play yards with profits from other unrelated product sales. While importers will not directly bear the cost of redesign, the cost of redesign will be reflected in their wholesale cost.

As noted earlier, it is likely that the entire market for play yards would shrink due to reduced consumer demand for the smaller number of choices. This may disproportionately disadvantage smaller businesses, who may not have sufficient sales of other products to compensate for the loss of play yard and play yard mattress sales.

B. Potential Impact on Large Businesses

The burden on large businesses per establishment could be similar to the burden on small businesses, although larger businesses likely have more cash reserves to redesign and are more likely to have other product lines to stabilize revenue for the company as a whole.

However, some large businesses achieve economies of scale by making one model (with slight variations in packaging and labeling) for the North American market, because currently Canada and Mexico have very similar safety regulations for play yards to the CPSC standard. Specifically, both Canada[107] and Mexico[108] require a maximum mattress thickness of 38 mm

[105] Safety Standard for Crib Mattresses (2022): https://www.federalregister.gov/documents/2022/02/15/2022-02414/safety-standard-for-crib-mattresses
[106] "Exit the market" does not necessarily mean going out of business. Small businesses that sell a variety of children's products may stay in business, but stop selling play yards, either temporarily or permanently.
[107] https://laws-lois.justice.gc.ca/eng/regulations/SOR-2018-186/page-1.html#h-852524
[108] https://www.dof.gob.mx/normasOficiales/6054/seeco13_C/seeco13_C.html

(1.5 inches). If the U.S. has a different standard from Canada and Mexico, that would increase costs for businesses selling to the entire North American market.

IV – Impact on Consumers

Consumer choice could be reduced by the actions requested by the petitioners. Consumers would no longer be able to purchase a play yard with a mattress under 1.5 inches in thickness. The selection of play yards could be greatly reduced, particularly for rectangular play yards, which are the vast majority of the market. If the standard size for rectangular play yards is in the middle of the currently available dimensions, both the smaller, cheaper play yards and the larger ones with the most features could be removed from the market. The selection of play yard replacement mattresses is currently quite limited and could become more limited if firms choose to exit the play yard mattress market temporarily or permanently.

The least expensive play yards, which tend to be small and portable, could be eliminated from the marketplace as a noncompliant size, thus disproportionally reducing choice for low-income consumers. Alternatives are likely to be more expensive; the least expensive play yards currently sell for under $50, while the least expensive full-size cribs sell for about $120. Thicker mattresses would also likely be more expensive, raising prices at all sectors of the market, as well as negatively impacting portability. In addition, for a consumer who can afford only one product for both safe sleep and play, none of the other sleep products are a reasonable substitute for a play yard with regards to the play function. Multi-mode products, such as bedside sleeper/play yard combination products, cost as much as full-size cribs. The impact could also impact the higher priced end of the market. Consumers who could afford the most expensive play yard, and preferred a larger play yard with more features, could be unable to purchase such an item.

It is also possible that companies would eventually offer play yards at a variety of price points with different features within the one allowed size per shape as they do with full-size cribs. However, the selection is likely to reflect a narrower range of prices and features, at least in the first several years as the industry transitions to the requirements specified by the petitioners.

Consumers would still be able to purchase other safe sleep products including cribs, bassinets, cradles, and bedside sleepers. However, given survey results, consumers seem to prefer play yards (owned by 66 percent of parents with infants). A decrease in product variety and subsequent reduction demand would suggest a significant loss in consumer utility from these actions.

Additionally, none of the substitute sleep products are designed specifically for play. Bassinets may be relatively inexpensive but are not designed for children over 5 months of age. Cribs, cradles, and bedside sleepers tend to be larger, more expensive, and less portable than folding play yards. Multi-mode products tend to also be more expensive and less portable than folding play yards, and do not come in the same wide variety of sizes and shapes as play yards. The lack of portable options could lead parents who are traveling or living in temporary housing to resort to less safe sleep options. The design limitations could also reduce choice and increase prices for multi-mode products, particularly bassinet/play yards and bedside sleeper/play yards.

V. Conclusions

The actions requested by the petitioners could be costly to industry in the short term and reduce consumer choice. Small businesses and low-income consumers could be disproportionately impacted. Nearly every play yard currently on the market may need to be redesigned to be compliant with the proposed actions. Play yard mattresses could be redesigned or remarketed as activity mats or sleeping pads.

In the longer term, the market for play yards might adjust, as it did with full-size cribs, to offer a wide variety of prices and features within the standardized sizes requested by the petitioners. Consumers would still be able to purchase other safe sleep products, including bassinets, cradles, cribs, and beside sleepers, and companies would still be able to make and sell play yards and play yard mattresses.