

An Analysis of the Chemical Toxicity of the Top Ten Most Popular and Unique Baby Products and Toys Purchased on Amazon in 2018

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Abstract

Human health and wellbeing, including the extent to which materials may negatively impact the human body, is a fairly new concept in the sustainability realm. As all humans are exposed to a variety of materials and all bodies may react differently, studies have found that infants are the most vulnerable to health impacts stemming from chemical toxicity. Billions of dollars' worth of baby products and toys are purchased on Amazon every year without a comprehensive differentiator for consumers to understand which products may contain chemicals of concern. This is problematic since thousands of chemicals have not been adequately tested for safety in the United States and chemicals of concern have been linked to severe health defects and illnesses, including developmental issues and cancers. The purpose of this study was to identify the top ten most popular and unique baby products and toys purchased on Amazon in 2018 and to identify if healthier options exist both on Amazon, and in general. Using a hybrid of an exploratory study and a hypothesis testing methodology, the research findings demonstrated that the top ten Amazon products were, in fact, toxic and healthier products exist on Amazon, albeit less than their toxic counterparts, and many are sold through other retailers. It was also discovered that there is an enormous cost premium for healthier alternatives, antiquated federal regulations are allowing chemicals of concern to enter the consumer market, and there is a lack of public awareness on this topic. Although this research is specific to baby products and toys, all individuals and corporations such as Amazon may benefit from the public health and social equity issues surrounding chemical toxicity of materials identified through this research.

Chapter 1: Introduction

There are currently over 80,000 chemicals used in the manufacturing of everyday products in the United States (Natural Resource Defense Council, 2019). Out of these 80,000 chemicals, the United States Environmental Protection Agency (EPA) has only identified 14 chemicals of concern that must be regulated and limited in quantity (Environmental Protection Agency, 2019). Because of this, manufacturers are allowed to utilize the other 79,986 potentially toxic chemicals, which have not been adequately tested, in products that may come into contact with the human body. The Food and Drug Administration (FDA) has enforced nutritional labeling on food and drink products, allowing for consumers to interpret what is in their groceries, however, consumers in other markets are not always granted this transparency. Further, if the ingredients are listed on consumer goods, the general public does not always understand how or why these ingredients may impact the human body, especially those of babies. Thus, in the age of advancing technology, on-demand availability, and consumer ease with the help of establishments such as Amazon, consumers have access to an array of products, with or without ingredient lists, that can arrive on their doorsteps within one to two days.

Amazon was the second largest public retail company worldwide in 2017, with the second highest sales after Walmart (Carbonara, 2018). Expanding upon this track record, Amazon's sales volume reached 232.89 billion dollars (Statista, 2019) in 2018, which included the sale of baby products and toys. An extensive list of potentially toxic chemicals is allowed to be included within these items, which raises the central questions of this Capstone:

- To what extent is the general public aware of which chemicals are in the baby products and toys being purchased?

- To what extent is the general public aware of how their consumer purchasing decisions impact their children's health from exposure to such? Since babies cannot make purchasing decisions themselves, this control lies solely in the hands of adults.

Background

It is evident that the field of sustainability is shifting to encompass human health and wellbeing. This includes how materials that come into contact with the human body may impact our health. The concern is encompassed by the United Nations' (UN) third UN Sustainable Development Goal "Good Health and Wellbeing," which establishes a target to "substantially reduce the number of deaths and illnesses from hazardous chemicals..." (United Nations, 2019) by 2030. The effects of toxic materials on the body depends on exposure time, exposure route, and chemical makeup, however the age of humans also plays a key role in the severity of potential health impacts. In fact, the World Health Organization (WHO) has found that children are more vulnerable than adults in terms of health consequences attributed to the built environment and other environmental risks (World Health Organization, 2019). Although this health and wellbeing movement within sustainability is gaining recent traction, this is not a new issue. As far back as the 1970s, a flame retardant known as "Tris" caused controversy because it was used in children's pajamas and was proven to be a mutagen. (Haberman, 2015). Mutagens are "anything that causes a mutation (a change in the DNA of a cell)... [and] DNA changes caused by mutagens may harm cells and cause certain diseases, such as cancer" (National Cancer Institute, n.d.). The chemical was eventually removed from the material composition of children's pajamas, but it is not the only toxic chemical that has been on the market. Toxic chemicals are found everywhere in our homes, closets, schools, offices, and public realms, yet they are not always labeled as such. Consumers are able to purchase products without knowing,

understanding, or caring about the ingredients within them, which may be leading to the introduction of harmful chemicals into our bodies and our children's bodies.

Statement of the Problem

Several databases and guides are available to consumers to identify non-toxic baby products and toys, although they tend to favor cosmetics. These include the Environmental Working Group's (EWG) Skin Deep Cosmetics Database (Environmental Working Group, 2019), The Gentle Nursery (The Gentle Nursery, 2019), and Goop (Goop, 2019), to name a few. However, consumers must know to go to these specific databases to search for a healthier product and these resources combined do not draw as large of a crowd as Amazon does. Amazon itself also does not have an obvious non-toxic filter on their website. Therefore, Amazon consumers are generally left to browse toxic and non-toxic items without any differentiation, besides the prices and shipping speeds. This is even more alarming since Amazon recently unveiled a Baby Registry service that includes a welcome box worth \$35.00, a universal registry option, a registry completion discount of 15%, free 90-day returns, group gifting opportunities, and it also claims to have the earth's largest selection of baby items (Amazon, 2019). Enticing perks like these make Amazon an even more appealing platform for expecting parents, except they may not know how to determine if the products they are selecting contain toxic materials. This is disconcerting because any of these baby products and toys may contain a chemical that could cause the next "Tris" controversy.

There were over 100 million Amazon Prime subscribers in 2017 (Bezos, 2017). These consumers have the luxury of free two-day shipping, among other Amazon advantages. When shopping for baby products and toys, it is unlikely that Prime users and other loyal Amazon consumers are going to consult a non-toxic baby product database, identify a healthier product,

and go back to Amazon to search for the product, especially if the product was pre-selected on an Amazon registry. If these products are not Prime or on Amazon at all, then it is also unlikely that these consumers will buy the non-toxic product since they would have to pay for shipping that is generally longer and more expensive than Amazon's shipping services. These customers are more likely going to utilize the free two-day shipping from Amazon and will more likely be ordering baby products which may include toxic chemicals that are not adequately addressed by the EPA. In this day in age, this research process is difficult, time-consuming, and a deterrent.

This is an important problem because children are our future and we are responsible for their wellbeing from day one. Exposing them to harmful chemicals has been scientifically linked to causing health defects and some chemicals have even been associated with an increased cancer risk (Green Science Policy Institute, 2017). In fact, the American Cancer Society has projected that the number of worldwide deaths from cancer may reach 13 million by 2030. (American Cancer Society, 2019) Therefore, it is of the utmost importance that we limit exposure to toxic chemicals as early as possible, starting at the prenatal and infantile stages. Accordingly, this research addresses the lack of consumer awareness of chemical toxicity in baby products and toys based on Amazon purchases, via how these items may be impacting the human body, and by identifying whether healthier options exist on Amazon. My vision is for mothers, fathers, guardians, and non-guardians to use this research as guidance when selecting products for their children so that society as a whole can do their part in preventing childhood diseases attributed to chemical toxicity.

Purpose of the Study

The purpose of this study is to analyze the ingredients within the top ten most popular and unique baby products and toys that consumers purchased on Amazon in 2018, in order to

identify if they contain toxic materials that may cause health impacts. Secondly, this study will determine if healthier and/or completely non-toxic options for these products are available in general and if they are also available on Amazon. This is a crucial analysis to determine how toxic the baby product and toy market really is. Once the research is complete, the main goal will be to use the findings as an educational tool for future consumer purchasing decisions and to bring awareness to pathways of chemical toxicity in babies.

Rationale

There are a few scenarios that, combined, provide the rationale for this study:

1. Consumers may be aware that materials impact our health, but they do not understand how or which specific materials to avoid, therefore they are unable to make an informed decision when searching for a healthier product.
2. Consumers may be aware of material toxicity but prefer to order baby products and toys that are more cost-friendly or are the most convenient to access via Amazon Prime.
3. Consumers who are aware of this issue may assume that buying “BPA-free” products, for example, is the correct course of action without understanding what this term implies.
4. Most unfortunately, consumers may not be aware of this issue at all. There are several pathways revealing a lack of consumer recognition, education, and action on this topic.

In terms of health, the rationale behind this study is to emphasize the importance of reducing chemical toxicity through pathways that can be controlled. Humans of all ages are exposed to toxic chemicals throughout our lifetimes, but adults who research material ingredients in baby products and toys prior to purchasing them may play a role in reducing toxicity in babies. The Green Science Policy Institute has synthesized scientific studies on chemicals of concern and has found that babies exposed to toxic materials may develop decreased immune responses

to vaccines from highly fluorinated chemicals; developmental and reproductive effects from antimicrobials; lowered IQ, hyperactivity, and potentially cancer from flame retardants; hormone disruption from phthalates and bisphenols; nervous system disruption, neurological problems, and cancer risk from some solvents; and there are brain development concerns from exposure to metals such as mercury, arsenic, cadmium, and lead (Green Science Policy Institute, 2017). It is the duty of adults to protect our children, especially babies, from these potential and severe health impacts from chemicals of concern.

Research Questions

The research within this study addresses the key, underlying question of “how toxic were the most popular and unique baby products and toys purchased in 2018 from Amazon?” This question frames two hypotheses:

1. The most popular and unique baby products and toys purchased from Amazon in 2018 contained toxic materials.
2. Consumers have available baby products and toys that are less toxic than others, whether purchased on Amazon or through another retailer.

The two hypotheses will be tested via a mixture of a hypothesis and exploratory research study incorporating a variety of sources mixing together market research, manufacturer correspondence, toxic material databases, peer-reviewed articles, and science-based evidence supporting potential health impact claims. The significance of this study is both personal and professional. Personally, this research provides specific knowledge for future baby product and toy purchases. Professionally, this study contributes to the health and wellness movement of sustainability by analyzing what toxic materials are in the most popular and unique baby products and toys. The field of sustainability is growing increasingly aware of chemical toxicity

and the effects on vulnerable populations and comprehensive market analyses must be performed.

Glossary

The terms used for the purposes of this study are defined as outlined below. All terms are listed in the order of appearance.

1. Chemicals of concern – a chemical that “exhibits a hazard trait [to humans] or an environmental or toxicological endpoint” (California Department of Toxic Substances Control, 2011).
2. Toxic – containing or being poisonous material especially when capable of causing death or serious debilitation (Merriam-Webster, 2019).
3. Transparency – full disclosure of material ingredients within consumer products that is available to the public.
4. Baby products and toys – consumer items that are exposed to babies through a variety of pathways that are not part of the built environment and are neither articles of clothing nor food or drink products.
5. Built environment – includes all of the physical parts of where we live and work (e.g., homes, buildings, streets, open spaces, and infrastructure) (Center for Disease Control, 2011).
6. Non-toxic – an individual substance or fully assembled product that does not contain any chemicals of concern or other potentially toxic substances.
7. Chemical toxicity – the ability of a chemical molecule or compound to damage susceptible sites or cells in the human body or in other living biological systems including plants, animals, or even ecosystems (Science Direct, n.d.).

8. Carcinogen(s) – substances and exposures that can lead to cancer (American Cancer Society, 2019).

Assumptions and Limitations

The assumptions and limitations of this research study are as follows:

1. Assumptions

- a. As the second largest retail company globally, consumers tend to utilize Amazon over other websites/physical stores because of the attractive prices, ease of online shopping, baby registry benefits, Prime memberships, and fast shipping speeds.
- b. Most Amazon consumers will not stray from Amazon to search for non-toxic products because of the reasons listed above.
- c. The general public is not informed about the risk of chemical toxicity in everyday materials, especially in regard to the potential health impacts in babies.

2. Limitations

- a. Consumer reports that detail the top baby products and toys purchased from all consumer outlets are available for purchase, however, they are not financially feasible to obtain for this study. Therefore, this study solely focuses on published Amazon data. Amazon was the second largest public retail company worldwide in 2017, which is significant for this research.
- b. Actual human subjects were not tested for this specific research. All data provided within this document has been completed prior to this study.

Chapter 2: Methods

Description of Methodology

The research methodology selected to conduct this study was a hybrid between an exploratory study and a hypothesis study. The exploratory study method was selected because it is used for fairly new topics of study and the hypothesis method was selected because there are two predictions that must be tested in order to prove the outcome of my research. This hybrid methodology is demonstrated through two key phases of the research study:

1. Exploratory Study Phase – this involved researching the top ten most popular and unique baby products and toys purchased on Amazon in 2018, consulting with manufacturers and referencing publicly available data to develop a materials list per product, assessing the potential health impacts of the materials, and researching a healthier alternative, if any should exist.
2. Hypothesis Testing Phase – once the data were compiled, the two hypotheses below were tested in order to prove or disprove the predictions. These two questions were the deciding factors in determining how “toxic” the current baby product and toy market is:
 - a. The most popular and unique baby products and toys purchased from Amazon in 2018 contained toxic materials.
 - b. Consumers have available baby products and toys that are less toxic than others, whether purchased on Amazon or through another retailer.

Design of the Study

This study was designed to begin in the exploratory study phase. First, the research began with downloading data from Amazon in December of 2018 which revealed the most popular baby products and toys purchased through the retailer during the 2018 calendar year. This study

focuses on the most popular and *unique* baby products and toys, so it was crucial to filter out any duplicate products in order to have a comprehensive analysis of a wider array of items. For example, three out of ten of the most popular baby products were different versions and sizes of Pampers Diapers, therefore the most popular Pampers Diapers product was selected for the research and the next popular products were used to replace the two duplicate diaper products within the top ten. This ensured the most popular products are in fact, unique. Discretion was also used in deciding if the baby products and toys would come into direct contact with infants. For instance, a diaper pail liner and a bottle cleaning brush were omitted from this study since they do not come into direct contact with infants. Therefore, the next popular and unique items were used in their place. Once this filtering is complete, a final list of the top ten most popular and unique baby products and toys purchased on Amazon in 2018 was fully compiled.

Second, this research study is being used to highlight the transparency, or lack thereof, of manufacturer data. In order to identify the ingredients in each of the top ten products, manufacturer's websites were perused in order to determine how transparent the manufacturers are in terms of disclosing product ingredients. If the product materials were not listed in detail, including specific ingredients per part of the product assembly, then direct manufacturer correspondence was necessary. This was performed over the phone and through email. If the manufacturer was not transparent in their response, they were interrogated until a full ingredients list was received. If the manufacturer still did not reveal detailed information or did not respond, then it was concluded that consumers should be cautious of these baby products and toys since the manufacturers are hesitant to release the data.

Third, health impacts were determined by entering each of the materials into databases such as the EWG Skin Deep Cosmetics Database; which would determine the toxicity of

individual product ingredients based on peer-reviewed scientific evidence, the TOXNET Database run by the National Library of Medicine; which houses peer-reviewed studies on hazardous chemicals and toxicology, and other ad-hoc peer-reviewed studies where necessary.

Fourth, this study entered the hypothesis testing phase. Once all of the material information was gathered, each of the top ten most popular and unique baby products and toys received a letter grade based on the potential health impacts of the chemical ingredients. The grading mechanism used is as follows:

- A. The materials do not cause any concerning health impacts. This is the healthiest option available.
- B. The chemicals within the products contain allergens and have caused sensitizing in some studies. Minor irritation and redness have also been observed. Additionally, there could be limits to the exposure of these chemicals.
- C. The chemicals used in the products have been linked to general toxicity within the human body. This includes non-fatal or developmental organ toxicity.
- D. The ingredients within the product have caused developmental and/or reproductive organ toxicity proven through scientific studies.
- F. There is evidence that the chemicals used in the products are carcinogens and therefore may pose a cancer risk.
- I. The manufacturer did not disclose specifics of the material ingredients and was not transparent with the product data. Therefore, research is deemed inconclusive. It is recommended to avoid products from manufacturers who are choosing to not disclose their data.

The final letter grade of each baby product and toy was dictated by the “worst” chemical ingredient found within the material list. For example, if a product is made of four chemicals that do not cause any health impacts but the fifth ingredient is a known carcinogen, then the product is graded as an F. This method, of not using an “average grade” per individual product, is used because the lower the letter grade, the worse the potential health impacts may be. It is not worth risking the development of cancer in our children if a majority of the ingredients in a product are deemed safe. All it could take is one chemical out of many to cause a health risk.

Fifth, and also running parallel to steps two through four above, was the “healthier product assessment.” This exercise was conducted using a similar hybrid research method. Instead of relying on one online shopping retailer such as Amazon, the search for a healthier product involved inspecting various “non-toxic” websites to identify a large list of healthier product candidates. Each of the products were assessed using Steps two through four to determine a letter grade. This assessment also included identifying if the healthier products are available on Amazon and if they are eligible for Amazon Prime. This information is helpful to understand if the consumers on Amazon have access to healthier baby products and toys.

Data Analysis Check

Through research Steps three through five, the data were fully analyzed and the two hypotheses could be proven or disproven. The first hypothesis was tested using the average grade of the top ten most popular baby products and toys purchased on Amazon in 2018 and the second hypothesis was tested using the average grade of the top ten healthier alternatives. The main research question of “how toxic were the most popular and unique baby products and toys purchased in 2018 from Amazon?” was then answered.

Chapter 3: Results and Discussion

During the exploratory study phase, the products listed below were identified as the top ten most popular and unique baby products and toys purchased on Amazon in 2018. Following this list, a discussion of the toxicity results per each of the ten products, including the final grade, the worst chemical found, and the healthier alternative has been provided. Please refer to Appendix A for screenshots of the Amazon Baby Store's most popular products and toys purchased in 2018, Appendix B for all manufacturer correspondence, and Appendix C for the complete material data per each of the ten products and their healthier alternatives.

1. Pampers Sensitive Water-Based Baby Diaper Wipes
2. Pampers Swaddlers Disposable Baby Diapers
3. Kiinde Breast Milk Storage Twist Pouch
4. Mommy's Helper Outlet Plugs
5. Summer Infant Contoured Changing Pad
6. Nuby Ice Gel Teether Keys
7. Regalo Easy Step 39-Inch Extra Wide Baby Gate
8. The First Years Stack Up Cups
9. Munchkin Miracle 360 Trainer Cup
10. Philips Avent Soothie Pacifier (Amazon, 2018).

Individual Product Analyses

Product #1 Results. The Pampers Sensitive Water-Based Diaper Wipes are made of 12 materials that were fully disclosed on the manufacturer's website. Pampers is completely transparent with their data, which is an advantage that I observed over other manufacturers during the research. However, just because the manufacturer is fully publishing material

ingredient data, does not necessarily mean the products are non-toxic. Overall, Product #1 received a letter grade of C. This is due to the presence of polypropylene, which is used within the soft fabric of the diaper wipes (Procter & Gamble, 2019). In addition to evidence of polypropylene causing liver and gastrointestinal toxicity, according to the Environment Canada Domestic Substance List, polypropylene is expected to be toxic or harmful to non-reproductive organs and is classified as a medium health priority (Environmental Working Group, 2019). Since diaper wipes are used on the skin quite often, a healthier product is recommended for use.

Product #1 Healthier Alternative. Fortunately, for consumers and children who wear diapers and need the accompanying wipes, a healthier alternative exists. Named a “top scoring product” in EWG’s Skin Deep Database, the Bets & Emy Wipes have been “EWG Verified,” which means the wipes do not contain any chemicals of concern. There are only two ingredients within the product, water and grapefruit seed extract, which have been vetted through scientific literature and are deemed non-toxic (Environmental Working Group, 2019). Therefore, this product has received a letter grade of A. Unfortunately, this product is not available on Amazon and therefore may be passed up by Amazon consumers.

Product #2 Results. The Pampers Swaddlers Disposable Baby Diapers are comprised of 16 ingredients that are fully disclosed due to the aforementioned transparency practices of the company. With the entire brand valued at \$11.4 billion dollars, Pampers diapers are one of the most utilized baby products and are worn by over 25 million babies across the globe (Forbes, 2016). Unfortunately, these particular diapers have received a letter grade of F. This is because the skin protecting lotion used within the diaper includes petrolatum (Procter & Gamble, 2019), a petroleum-based ingredient that is commonly known to be contaminated with PAHS (Environmental Working Group, 2019). PAHS has been classified as a possible human

carcinogen by the European Union, the American Conference of Government Industrial Hygienists, the EPA Integrated Risk Information System, and the International Agency for Research on Cancer, to name a few (Environmental Working Group, 2019).

Product #2 Healthier Alternative. From this research, the Attitude Fragrance-free Baby Diapers have been deemed the healthiest diaper alternative. The diapers are made of four ingredients, all fully disclosed by the manufacturer, that are non-toxic to the human body. The worst ingredient found, a superabsorbent polymer known as sodium polyacrylate (Attitude, 2019), causes nasal irritation in manufacturing workers (Holm, Dahlman-Höglund, & Torén, 2011). This has resulted in the product receiving a letter grade of B due to an observed limit to exposure. Further, not only are the Attitude Fragrance-free Baby Diapers generally safe for the human body, but they are also biodegradable and environmentally friendly (Attitude, 2019). Luckily for Amazon consumers, these diapers are available for purchase on Amazon and are eligible for Amazon Prime.

Product #3 Results. Unlike the first two products that have direct exposure to the body, the ingredients within the Kiinde Breast Milk Storage Twist Pouch may leach into the milk that is then consumed by babies. Product #3 contains four components and four corresponding materials that information on which was obtained by corresponding via email with the manufacturer. Out of the four product components, the pouch's inner layer, outer layer, and spout/cap assembly all contain a form of polyethylene. According to the National Library of Medicine, there is evidence that this chemical may cause irritation and the FDA has recommended polyethylene to have limited uses in food products (Environmental Working Group, 2019). Therefore, Product #3 receives a letter grade of B. Although this grade is on the healthier end of the scale, the lack of manufacturer transparency on their website is concerning.

Product #3 Healthier Alternative. If a consumer is skeptical of polyethylene, a healthier alternative for a breast milk storage unit is to use a glass jar with a non-toxic lid. Composed of only glass, bamboo, and silicone (Life Without Plastic, 2019) per the manufacturers website, the Life Without Plastic glass jars receive an A letter grade. Glass is not a toxic material (Environmental Working Group, 2019) and there is no evidence of bamboo toxicity (Lu, Wu, Tie, Zhang, & Zhang, 2005). In terms of the silicone, according to a study featured in *Systems Biology in Toxicology and Environmental Health*, “safety reviews of both cyclic and linear siloxanes, [which are the polymers that create silicone], concluded that these compounds, as they are currently used in consumer products, are safe” (Tilley & Fry, 2015). Further, “acute toxicity studies of siloxanes have been conducted in rats and have found no toxic effects in response to acute dermal or oral doses comparable to those of human exposure” (Tilley & Fry, 2015). Unfortunately, this product is not available on Amazon or Amazon Prime at this time.

Product #4 Results. The Mommy’s Helper Outlet Plugs are made of one ingredient, polypropylene. This information was not readily available on the manufacturer’s website and direct manufacturer correspondence was required. For the same reasons as Product #1, Product #4 receives a letter grade of C. Consumers may not be immediately concerned with purchasing healthier outlet plugs since the pathway to human exposure may be unclear, but babies and toddlers who crawl and/or walk are touching everything within reach. The main objective of outlet plugs is to cover an area that a child may get to, therefore there is an assumed direct exposure to the body.

Product #4 Healthier Alternative. To prevent the potential organ toxicity that may develop because of polypropylene, a recommended healthier option is the Bink Dots Safety Plug product. Made of only ABS plastic, this material has shown evidence of respiratory irritation and

pulmonary irritation in factory workers who have increased exposure (Toxicology Data Network, 2015). This information was sourced via manufacturer correspondence. Because of this evidence, the product has received a B letter grade. Although this is not ideal, outlet plugs must be made of a material that is not conductive to electricity, which limits the material options. Additionally, infants will not have the same amount of exposure to the chemical as factory workers do, therefore this product can be considered a safe option. The Bink Dots Safety Plugs can be found on Amazon and are eligible for Amazon Prime.

Product #5 Results. The Summer Infant Contoured Changing Pad is made of four ingredients, two of which were disclosed on the manufacturer's website: PEVA vinyl and polyurethane foam (SUMR™ Brands, 2019). The manufacturer did not respond to the request for information regarding the material composition of the strap and buckle. While laying on the changing pad, the most toxic ingredient infants are exposed to is the polyurethane foam. According to polymer toxicity study, "the polymers that ranked as most hazardous are made of monomers classified as mutagenic and/or carcinogenic [and] these belong to the polymer families of polyurethanes..." (Lithner, Larsson, & Göran, 2011). Therefore, Product #5 receives a letter grade F due to the potential cancer risk.

Product #5 Healthier Alternative. Instead of using polyurethane foam, the Naturepedic No-Compromise Organic Cotton Changing Pad uses food-grade polyethylene as the mattress filling (Naturepedic, 2019). As previously mentioned, this chemical may cause irritation and thus, the product receives a letter grade B. In addition to the healthier filling material, since the fabric and part of the filling is made of organic cotton, babies are not exposed to common cotton crop pesticides that are suspected to cause cancer in the brain/central nervous system, liver/biliary, prostate, and/or soft tissue sarcoma (U.S. Department of Health and Human

Services, 2010). Material ingredients were obtained through both publicly disclosed data and manufacturer correspondence. Consumers have this product available to them on Amazon and it is also eligible for Amazon Prime.

Product #6 Results. The Nuby Ice Gel Teether Keys is a product that has been solely created for infants to put into their mouths during the teething stage of life. The manufacturer does not publish the specific material data on their website, instead, there is a note that the product is “BPA-free,” a concerning statement that will be further analyzed within the next chapter. During email correspondence with the manufacturer, a list of materials was obtained, however, the Nuby representative chose to not disclose the specific thermoplastic elastomer (TPE) used on the outer layer of the product. This is concerning since there are three main types of TPEs; one of which contains polyurethane (McKeen, 2010) which is a known carcinogen (Lithner, Larsson, & Göran, 2011). Therefore, Product #6 has been labeled with a letter grade of F.

Product #6 Healthier Alternative. Instead of allowing an infant to potentially chew on polyurethane-derived plastic, a healthier teething alternative has been created by Hevea Planet, a company that incorporates pure natural rubber, known as *hevea brasiliensis*, into their products. Per the manufacturer’s website, the Panda Teether product is made of 100% pure natural rubber (HEVEA, 2018), which according to an article in the Lipids in Health and Diseases Journal, has been deemed as non-toxic to humans (Salimon, Abdullah, & Salih, 2012). Because of this, the product receives a letter grade of A. The Hevea Planet natural rubber teether is available on Amazon and is also eligible for Amazon Prime.

Product #7 Results. Product #7, the Regalo Easy Step 39-Inch Extra Wide Baby Gate, is a popular item for baby-proofing interior spaces. The manufacturer’s website was not completely

transparent, therefore, email correspondence transpired. The manufacturer stated that they do not have a detailed materials list, although the product has passed the ASTM F1004 test for lead and phthalates. The manufacturer also listed six non-specific ingredients within the gate, including plastic, while also alluding to more components with the use of “etc.” Because it was revealed that the gate has some plastic parts, there is a risk of exposure to bisphenols which “can mimic or block hormones, disrupting vital body systems. [This is significant since] young children and fetuses are especially vulnerable [to these chemicals]” (Green Science Policy Institute, 2019). Further, without a detailed materials list, it is unclear if the plastic parts are made of TPE, which could contain polyurethane, as previously discussed. Because of the lack of information and risk of toxicity, the product has received a letter grade of I for inconclusive findings.

Product #7 Healthier Alternative. Consumers who are looking for a baby-proof gate manufacturer that uses healthier materials in their products and discloses ingredients may be interested in Evenflo. Their wooden Walk-Thru™ Top Of Stairs Baby Gate contains three ingredients, with the worst ingredient being polyethylene within the wood finish. This information was obtained through both the product’s website listing and manufacturer email correspondence. As previously stated, there is evidence that this chemical causes irritation and should be limited in use per the FDA. Because of this, the healthier alternative to Product #7 has received a letter grade of B. This product is available to Amazon consumers and is available on Amazon Prime.

Product #8 Results. The First Years Stack Up Cups are part of an important family of baby toys, as they “are excellent for supporting speech and language development” (Levy, 2016) according to Speech-Language Pathologist Andrea Levy. However, as reported by the manufacturer, the worst ingredient the cups are made of is polypropylene. This information was

sourced via manufacturer correspondence since it was not disclosed on the manufacturer's website. Similarly, for Products #1 and #4, which also contain polypropylene, Product #8 receives a letter grade of C due to expected non-reproductive organ toxicity, among other concerns. Although the purpose of these cups is to physically stack and play with them, they will surely end up in babies' mouths.

Product #8 Healthier Alternative. A healthier stacking toy that offers the same cognitive development benefits as Product #8 is the Lollipop Stacking Bowl set by Grimm's. According to one of the distributor's highly transparent websites, the stacking set is made of four types of sustainably-harvested wood and safe, water-based paints (Sprout Children LLC, 2018). The specific distributor, Sprout San Francisco, confirms that all toys available through their store are "... free of toxic chemicals [including] BPA, phthalates, toxic dyes & perfumes, pesticides, PVC, & added formaldehyde" (Sprout Children LLC, 2018). Therefore, the healthier alternative to Product #8 receives a letter grade of A. Currently, this product is listed on Amazon's website but it is unavailable for purchase and thus does not have an Amazon Prime option.

Product #9 Results. The Munchkin Miracle 360 Trainer Cup is a "sippy cup" that is designed to be put into babies' mouths. Because of this, there is a high risk of exposure to the materials that might compromise this product. Since the manufacturer does not disclose the material ingredients on their website, email correspondence transcribed. It was revealed that the worst ingredients within the cups is, again, polypropylene. As noted in Products #1, #4, and #8, this material is linked to non-reproductive organ toxicity and the item has been graded with a C.

Product #9 Healthier Alternative. Sprout San Francisco, the distributor that sells non-toxic baby products and toys, offers a stainless steel and medical-grade silicone version of a sippy cup produced by Pura Kiki. Since this product is 100% plastic free, consumers do not have

to worry about exposure to bisphenols, in addition to other toxic chemicals (Sprout Children LLC, 2019). This product was the only plastic and polypropylene-free sippy cup found during the research. Because of the healthier materials used within the product and the strict, non-toxic guidelines of Sprout San Francisco, this product receives a letter grade of A. This product is available on Amazon and is eligible for Amazon Prime.

Product #10 Results. The Philips Avent Soothie Pacifier is made of one ingredient, 100% medical-grade silicone (Koninklijke Philips N.V., 2019). Philips is completely transparent with this information on their website. Since the analysis for product #3 has already determined that silicone is considered to be non-toxic and this pacifier is considered medical-grade, no healthier alternative is necessary. The letter grade for the Philips Avent Soothie Pacifier is an A. As this product is one of the top ten Amazon products analyzed for this research, it is indeed available on Amazon and is eligible for Amazon Prime.

Results Summary

The average grade of the ten most popular and unique baby products and toys purchased on Amazon in 2018 is a D+ and the average grade of the healthier alternatives is a B+. The most prevalent ingredient within the top ten Amazon products was polypropylene (four products) and the worst ingredient found was polyurethane (one confirmed product, two potential products). One of the top ten Amazon products (10% of this study size) is considered to be non-toxic and did not require the search for a healthier alternative. Overall, 70% of the healthier alternatives are available on Amazon and Amazon Prime, although one of the healthier options is listed on Amazon but is not available for purchase at this time. Because of these findings, both hypotheses have failed to be rejected. In addition, 40% of the top Amazon product manufacturers fully publish their material data versus 70% of the healthier alternative manufacturers.

Chapter 4: Conclusion and Recommendations

With an average grade of D+, it is necessary to dissect why consumers are buying baby products and toys that contain toxic chemicals on Amazon and why toxic chemicals are allowed to be included in baby products and toys. Although the specific reasons for consumer purchases will differ per individual, there are a few themes that have emerged through this study. These include the cost of the baby products and toys, marketing tactics that highlight misleading information, the lack of consumer awareness of chemical toxicity, and the various manufacturing and production laws in the United States. Recommendations for consumers, Amazon, and governing bodies have been provided, with the goal of reducing and eventually eradicating toxic chemicals in baby products and toys.

Potential Reasons for the Popularity of Toxic Products on Amazon

Financial Analysis. As evaluated in Appendix C, if all of the top ten Amazon products were purchased, consumers would spend a total of \$168.93. In contrast, if all of the healthier alternatives were purchased, consumers would spend a total of \$338.15. The average cost premium for the healthier products is 393%, with the lowest price gap at 42% (disposable diapers) and the largest price gap at 1098% (stacking toys). This price difference is significant and could be a deterrent to consumers. In fact, a survey by Deloitte and the Grocery Manufacturers Association found that “even though the top tier of green shoppers will frequently pay more [for healthier products], most shoppers would like green products to be price competitive. They often don’t understand or buy into the rationale that a green product should be more expensive” (Grocery Manufacturers Association, 2009). Further, not all consumers are able to afford healthier products and do not have the option of contemplating these decisions. Consumer spending trends in 2013 unveiled that the lowest income group in the United States

spent \$286 on pets, toys, and playground equipment combined (Bureau of Labor Statistics, 2015). This translates to \$313.94 in 2019 dollars (Bureau of Labor Statistics, 2019), meaning this income group could not afford all of the healthier baby product alternatives presented within this research. It is unacceptable to deprive low-income families of healthier alternatives for their children due to unreasonable price gaps between toxic and non-toxic baby products. This should not be a luxury or a social equity issue, but an essential human right.

Misleading Information and Consumer Awareness. Another category of decision-making drivers for consumers involves a variety of misleading information and lack of public awareness of toxicity in baby products. First, consumers may be misled by statements such as “BPA-free,” which is a marketing strategy targeted at the misinformed population. When a product advertises that it is free of a certain chemical, there is a chance that the chemical has been replaced with one of the other 79,968 chemicals which have not been adequately tested. An article based on the work of Dr. Joseph Allen at the Harvard T.H. Chan School of Public Health states “this tactic—which researchers call ‘regrettable substitution’—has been used in the formulation of products such as pesticides, flame-retardant furniture, non-stick pans, and nail polish. The chemical replacements need only be different enough to be considered distinct by regulators. They don’t have to be proven safer” (Harvard School of Public Health, 2017). More specific to this research, the Nuby Ice Gel Teether Keys (product #6) and The First Years Stack Up Cups (product #8) both claimed to be “BPA-free” on Amazon. Consumers should be aware that “BPA may simply have been swapped for BPS, or bisphenol-S, a similar chemical thought to be even more harmful to children’s health” (Harvard School of Public Health, 2017). Since BPA and its regrettable substitutions are found in plastic (Green Science Policy Institute, 2017), it is suggested to stay clear of all products that are made of plastic, when affordable, unless it is a

healthier plastic such as ABS (Toxicology Data Network, 2015). This healthier plastic is used within the Bink Dots Safety Plug product, the healthier alternative to product #4.

In terms of public awareness regarding the potential chemical toxicity in products, a study in the Environmental Sciences Europe journal “asked [participants] whether they knew that products can contain chemicals harmful for human health [and] nearly 10% of the survey participants answered that they would not know this. [These] answers depended on the knowledge in chemistry” (Hartmann & Klaschka, 2017). The study also found that “most of the parents with minor children were interested for health reasons in toys (94.0%), compared to only 56.6% of persons without minor children” (Hartmann & Klaschka, 2017). In more broad terms, other studies have concluded that “although this is an ongoing concern for academic researchers, recent studies demonstrate that knowledge on the hazards and risks associated with the use of chemicals continues to be very limited” (Luca, Ciobanu, Andrei, & Horodnic, 2018). These discoveries highlight the importance of increasing educational tactics on this subject and, especially targeting those who do not have a background in chemistry and those without minor children who may be gifting baby products to others.

Manufacturing and Production Laws in the United States. Although Amazon ships internationally, this research was based in the United States and therefore focuses on the United States regulations in comparison to the current leading regulations of the European Union. The EPA has made some improvements in regulating chemicals of concern, but there is still progress to be made. Originally, the Toxic Substances Control Act (TSCA) of 1976 “maintained an inventory of chemical substances made or used within the United States and performed evaluations of new chemicals entering the marketplace” (Jones Day, 2017). As of June 2016, an amendment to the TSCA known as the Frank R. Lautenberg Chemical Safety Act of the 21st

Century, “provides [the] EPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures. Certain substances are generally excluded from TSCA, including, among others, food, drugs, cosmetics and pesticides” (United States Environmental Protection Agency, 2018). Both versions of the TSCA regulate and/or prohibit a substance if it “present[s] a significant risk of serious or widespread harm to human beings from cancer, gene mutations, or birth defects” (Schierow, 2009). Regarding baby products and toys, the United States Consumer Product Safety Improvement Act (CPSIA), which is a 2008 amendment to the original Consumer Product Safety Act (CPSA) of 1972, was established to regulate the safety of children’s products. Focusing more on the actual durability and physical safety of products, this regulation also limits the use of lead and phthalates, which are two chemicals of concern. However, the TSCA and CPSIA are not comprehensive enough for modern science and do not address all of the top ten baby product categories highlighted within this research.

The Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) regulation in the European Union is much more robust. To expand upon the health concerns of TSCA and CPSIA, REACH also regulates “substances that are either carcinogenic, mutagenic, toxic to reproduction, persistent and bioaccumulative, or causing a similar concern (e.g., endocrine disruptors)” (Jones Day, 2017) which more align with the chemicals of concern within this research. In addition, “researchers analyzed these... regulations and agreed that regulatory standards in Europe are tighter... than their American equivalents. [Further,] chemical manufacturers... favor US regulations when compared to the EU (Luca, Ciobanu, Andrei, & Horodnic, 2018). Therefore, it makes the United States much more attractive for manufacturers to use chemicals in products that would be banned in the European Union.

A positive sign that chemical-health impact awareness is growing is that a number of states within the United States have developed their own children's toy chemical safety laws.

The statutory chemicals laws are as follows:

- Broad Chemical Regulations: California, Connecticut, Maine, Massachusetts, and Minnesota
- Hazardous Substance Regulations: California, Colorado, Connecticut, Illinois, Maryland, Massachusetts, Michigan, Montana, New Hampshire, North Dakota, Oregon, South Carolina, Tennessee, and Wisconsin.
- Cadmium Regulations: California, Connecticut, Maryland, and Illinois
- Lead Regulations: Connecticut, Delaware, Illinois, Maryland, Massachusetts, Michigan, Vermont
- Phthalates Regulations: California and Vermont
- BPA Regulations: Maine and New York
- Tris Regulations: Maryland and New York
- Chemical Registration Laws: Texas
- Yo-Yo Water Ball Ban: Illinois, New Jersey, and New York (The Toy Association, Inc., 2019).

California leads in terms of regulations, with six different chemical laws for children's toys and Connecticut, Illinois, Maryland, have all enacted four regulations. Although these regulations are progressive, only three chemicals of concern are addressed. Moreover, this list represents only half of the states within the country, which means the remaining 25 states are only abiding by the TSCA and CPSIA. Since these statutory regulations are all different and not entirely comprehensive, they are not serving as a proper educational tool for Americans and may

lead to confusion. When selling a product on Amazon, the seller must “comply with all applicable federal laws when listing and selling products on Amazon.com ...[and] must also comply with state and local laws applicable to the jurisdiction into which your products are sold” (Amazon, n.d.). This means that an Amazon consumer may be fortunate enough to receive a healthier product from California, for example, or a product that is more toxic from a state without enhanced chemical regulations. In comparison, the REACH regulation serves the entire European Union, therefore the entire European population shares the benefits of chemical safety and an educational framework.

Recommendations by Stakeholder

Consumer Recommendations. Considering that there is a lot of information for consumers to comprehend and recognize for future purchases, the following suggestions are intended to be used as general guidance where applicable:

1. Understand and identify where chemicals of concern are likely to be found in baby products, toys, and everywhere else in the built environment. The Green Science Policy Institute has separated chemicals of concern into six classes according to potential health impacts (Green Science Policy Institute, 2017). The website has also removed all technical language which makes the information easy to digest for all audiences. Visit www.sixclasses.org to learn more about where the six classes of chemicals are most prevalent. For the more technical audience, it is encouraged to stay up to date on the most recent research articles on this topic.
2. If a consumer is a loyal Amazon customer, try expanding beyond Amazon to purchase healthier selections. There are smaller establishments, such as Sprout San Francisco, that only sell healthier baby products and toys. It is also recommended to shop at local “brick

and mortar” stores to boost the local economy. In-person shopping will avoid paying for shipping fees that would also be avoided through Amazon Prime. Although 70% of the healthier alternatives presented within this research are found on Amazon, this was just a sample of baby products and toys. Therefore, it is expected that other types of baby products and toys are not found on Amazon.

3. Read labels, target manufacturers who publish their material data, and put pressure on those who do not disclose this information. It is unacceptable that only 40% of the Amazon top product manufacturers publish their material data. The more stress consumers put on public disclosures, the more manufacturers will respond. If a complete material list is not available online or in person, consumers should directly contact the manufacturer in question. If the manufacturer does not respond or chooses not to disclose information, then it is recommended to avoid this manufacturer since they are hiding information. Consumers need to join together to send a message about being transparent and reducing chemical toxicity. Only then will change happen.
4. Consider purchasing fewer baby products and toys and focus on the essentials. Instead of buying multiple items, learn to live with fewer possessions and teach your children the same values. This shift in consumerism will help ease the cost premium of buying healthier alternatives. Investing in high-quality, toxic-free items may also avoid future medical costs associated with health impacts from chemical toxicity.
5. Share your findings with friends and family. If parents are expecting a child and desire a toxic-free baby nursery, it is extremely important that all gift-givers are aware of these expectations. Knowledge-sharing will also lead to a more educated consumer base and hopefully a toxic-free manufacturing innovation.

Amazon Recommendations. Amazon has the opportunity to play a key role in preventing consumers from purchasing toxic baby products and toys. It is highly recommended that Amazon incorporates the following changes to become a leader in the healthier-product movement:

1. Incorporate an effective, non-toxic differentiator on the website. This could be in the form of either an icon on a product's image and also through a filter or "sort by" function. Amazon currently has a Healthier Generation Store that offers healthier baby food alternatives and a Worry Free Store that includes healthier topical products for babies, but neither store is intuitive to find or all-encompassing for baby items. In fact, neither of these stores are listed in the main Amazon navigation drop-down menu, which means they are generally hidden unless a consumer already knows to search for these stores. Most importantly, the Amazon Baby Store does not include any non-toxic differentiator. Appendix D shows all of the available filtering options for baby products and toys on the Amazon Baby Store. Not once on the Baby Store's webpage is there any language regarding healthier alternatives. This is unacceptable, an antiquated approach, and a missed opportunity by Amazon. Healthier alternatives should be the easiest items to locate on any consumer website, especially those selling baby products.
2. Make all healthier alternatives eligible for Amazon Prime. If cost and delivery speed are the deciding factors, consumers should not be punished by paying more for longer shipping periods to receive healthier products. This is a hindrance for consumers who are looking for ease, affordability, and speediness.

United States Federal Regulation Recommendations. Since manufacturers prefer the United States chemical regulations over REACH, clearly there are some lenient loop-holes that are in need of improvement. It is recommended that the United States governing bodies consider the following:

1. Update the TSCA and CPSIA to align with REACH in terms of regulating more substances that have been identified as chemicals of concern. Ideally, the United States regulations should also ban all chemicals that are included within the six classes of chemicals determined by the Green Science Policy Institute. Another benefit of REACH is that the website is extremely clear in terms of explaining the regulation, who it applies to, how data is evaluated, what is restricted, and it even offers communication tools. The TSCA website offers a non-descriptive, one-page summary and then links the entire regulation text, which is not legible to those who do not have experience reading legal documents. This can be confusing to the general public.
2. Align all 50 states to enforce one children's toy chemical safety law. This law should prevent all chemicals of concern from entering the manufacturing stream. If the country updated the TSCA, CPSIA, and all states followed the same toy chemical safety law, then the United States would be in an ideal position to reduce chemical toxicity in babies. The European Union serves as another great example of the success of alignment by enforcing REACH among 28 countries, instead of having numerous, confusing laws.
3. Ensure all baby products and toys are regulated under at least one federal standard. This is imperative to ensuring our children are not exposed to harmful chemicals at an

early age or even at all. For example, disposable diapers are not regulated under any law in the United States. Title 21 of the FDA's Code of Federal Regulations does not cover diapers for infants under medical devices although it regulates adult diapers (U.S. Food & Drug Administration, 2018), the FDA also does not consider diapers as a cosmetic (U.S. Food & Drug Administration, 2019) even though this research has proven cosmetics are included (i.e. skin protecting lotion), and the Textile and Wool Acts do not cover diapers, even though they are a garment that is worn by infants (Federal Trade Commission, 2019). The lack of federal regulations for disposable baby diapers is one of the main reasons for product #2 receiving a letter grade of F.

Closing Statement

As of 2017, 19% of toxicity exposure cases were attributed to cosmetics, personal care products, foreign bodies, toys, and miscellaneous items – all categories included within this research, with 99.4% of these cases being noted as unintentional in children less than 6 years old (National Capital Poison Center, 2017). As there are no comprehensive chemical manufacturing regulations in the United States, toxic chemicals are allowed to exist in baby products and toys and are negatively impacting our most vulnerable populations. With billions of dollars' worth of products being purchased on Amazon every year without a non-toxic differentiator and a lack of public awareness of this issue, consumers are unknowingly enabling chemical toxicity in babies.

Scientists and engineers are solving climate change and are searching for the cure to cancer, yet we are largely ignoring how materials affect the human body and how they may be the culprit to numerous ailments. With an average grade of a D+ for the most popular baby products and toys purchased on Amazon in 2019 and an average premium of 393% for healthier alternatives, the risk of chemical toxicity is becoming a public health issue and also a social

equity issue in terms of cost. The European Union is currently guiding the world in the right direction with REACH, setting a great baseline for the United States to improve upon. Together, world leaders, informed populations, and Amazon can support the UN in reducing the number of deaths and illnesses from hazardous chemicals (United Nations, 2019) and now have the opportunity to spread awareness of toxic chemicals in baby products and toys through this new frontier of sustainability.

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Appendices

Appendix A: Amazon Baby Store's Most Popular and Unique Products and Toys Purchased in 2018

 <p>Pampers Sensitive Water-Based Baby Diaper Wipes, 9 Refill Packs for Dispenser Tub... ★★★★☆ 1,412 \$14.64 ✓prime</p>	 <p>Pampers Swaddlers Disposable Baby Diapers Size 4, 150 Count, ONE MONTH SUPPLY ★★★★☆ 786 \$50.99 ✓prime</p>	 <p>Pampers Swaddlers Disposable Baby Diapers Size 5, 132 Count, ONE MONTH SUPPLY ★★★★☆ 786 \$49.99 ✓prime</p>	 <p>Pampers Sensitive Water-Based Baby Diaper Wipes, 9X Pop-Top - Hypoallergenic and... ★★★★☆ 180 \$14.64 ✓prime</p>	 <p>Pampers Swaddlers Disposable Baby Diapers Size 3, 168 Count, ONE MONTH SUPPLY ★★★★☆ 786 \$49.34 ✓prime</p>	 <p>Kiinde Breast Milk Storage Twist Pouch (6 oz - Pack of 40) ★★★★☆ 2,484 2 offers from \$11.09</p>
<p>#7</p>  <p>Mommy's Helper Outlet Plugs, 36 Count ★★★★☆ 3,329 \$2.99 ✓prime</p>	<p>#8</p>  <p>Summer Infant Contoured Changing Pad ★★★★☆ 9,480 \$14.99 ✓prime</p>	<p>#9</p>  <p>Nuby Ice Gel Teether Keys ★★★★☆ 3,149 \$3.54</p>	<p>#10</p>  <p>Regalo Easy Step 39-Inch Extra Wide Baby Gate, Bonus Kit, Includes 6-Inch Extension Kit, 4 Pack... ★★★★☆ 8,807 \$33.99 ✓prime</p>	<p>#11</p>  <p>ChoiceRefill Compatible with Diaper Genie Pails, 4-Pack, 1080 Count ★★★★☆ 1,089 \$16.82 ✓prime</p>	<p>#12</p>  <p>The First Years Stack Up Cups ★★★★☆ 2,767 \$3.99</p>
 <p>New Releases in Baby</p>		 <p>Movers & Shakers in Baby</p>		 <p>Most Wished For in Baby</p>	
<p>#13</p>  <p>Pampers Aqua Pure 6X Pop-Top Sensitive Water Baby Wipes - 336 Count ★★★★☆ 451 \$14.97 ✓prime</p>	<p>#14</p>  <p>OXO Tot Bottle Brush with Nipple Cleaner and Stand, Gray ★★★★☆ 2,046 \$6.99 ✓prime</p>	<p>#15</p>  <p>Pampers Swaddlers Disposable Baby Diapers Size 6, 108 Count, ONE MONTH SUPPLY ★★★★☆ 786 \$51.42 ✓prime</p>	<p>#16</p>  <p>Pampers Swaddlers Disposable Baby Diapers Size 2, 186 Count, ONE MONTH SUPPLY ★★★★☆ 786 \$50.26 ✓prime</p>	<p>#17</p>  <p>Munchkin Miracle 360 Trainer Cup, Green/Blue, 7 Ounce, 2 Count ★★★★☆ 4,092 \$12.99 ✓prime</p>	<p>#18</p>  <p>Philips Avent Soothie Pacifier, Pink/Purple, 0-3 Months, 2 Count ★★★★☆ 4,051 \$3.79 ✓prime</p>

Source: (Amazon, 2018), Products analyzed have been outlined in red.

Appendix B: Manufacturer Correspondence

Please see accompanying PDF file titled Appendix B.

Appendix C: Complete Material Analyses

Please see accompanying Microsoft Excel Workbook titled Appendix C.

Appendix D: Amazon Baby Store Webpage

Please see accompanying PDF file titled Appendix D.