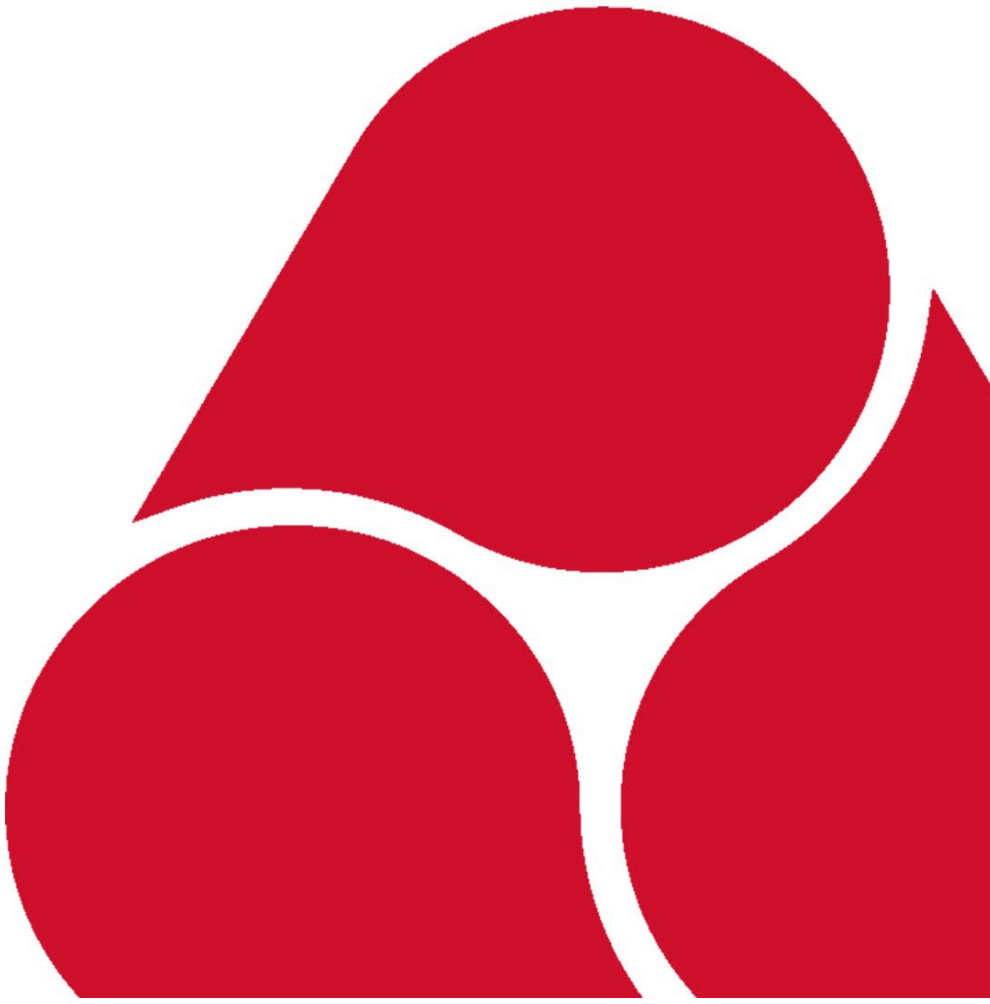
Office for Product Safety & Standards

Estimating detriment from unsafe and non-compliant products on the UK market

March 2026



Contents

1 Executive Summary

Disclaimer

This analysis is intended for informational purposes and does not create legal or policy obligations. Assumptions and limitations are documented in the accompanying methodology. This document does not provide legal advice.

1.1 This project aims to strengthen the evidence base regarding the benefits of removing unsafe and non-compliant products from the UK market. This work is important in strengthening the analytical foundations that support regulatory decision-making and help the Office for Product Safety and Standards (OPSS) prioritise activity where it delivers the greatest benefits. The goal is to provide a robust, evidence-based methodology and model to value the consumer and business detriment caused by unsafe and non-compliant products.

1.2 Activities undertaken as part of the project include a scoping of relevant types of consumer and business detriment, and interviews with experts (including from market surveillance authorities, consumer organisations, industry experts and academia). A literature review was undertaken to cover methodologies to measure consumer and business detriment and applications of these approaches. The approach also includes an extensive data review and a data gathering exercise which covered numerous UK and international sources. This work builds on analytical foundations developed by London Economics through earlier commissioned research by OPSS in 2020, which informed the initial development of the methodology.

1.3 The report demonstrates the development of an economic model to estimate the per product consumer and business detriment caused by unsafe and non-compliant products on the UK market.

Approach

The model estimates the value of detriment for the following **consumer detriments**:

- physical harm to consumers;
- damage to property[1];
- cost of replacing the product due to (i) physical harm and (ii) damage to property;
- time loss due to (i) physical harm and (ii) damage to property; and
- time loss due to product recalls.

Likewise, the model covers the following **business detriments**:

- displacement of compliant product sales;
- business costs of absent workers;
- reputational damage due to physical harm to consumers and property damage;
- insurance payouts for damage to property;
- costs to businesses of a product recall; and
- reputational damage from product recalls.

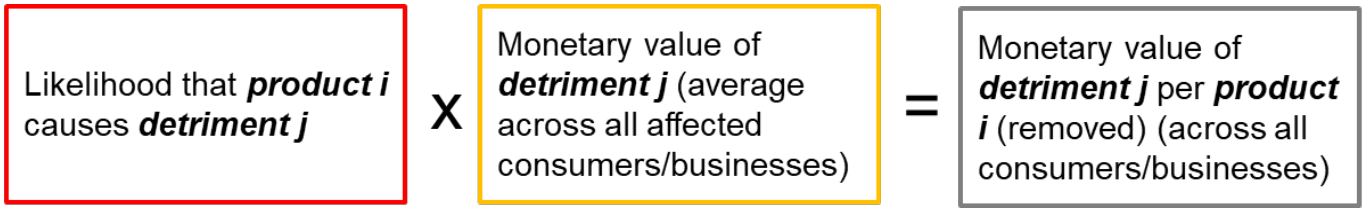
[1] Damage to property refers to potential damage by product-related hazards and does not include product deterioration over time.

1.4 The detriments are modelled for **21 product categories**. These product categories include, for example, childcare products, electrical appliances, and toys. The full list of product categories (and the rationale for including them) is provided in the Technical Appendix.

1.5 The **per product** value of detriment is calculated for each product category and detriment pair. An overarching calculation approach shown in Figure 1 below, is applied throughout. To understand this approach, consider the calculation of the value of physical harm (e.g., an injury) due to an unsafe toy. The value of this detriment *per unsafe toy* is calculated by multiplying the **likelihood** that each unsafe toy could cause this detriment by the **monetary value** of the detriment.

1.6 We can generalise this calculation approach by expressing it for product type *'i'* and detriment *'j'*. Product *'i'* may stand for unsafe toys, or unsafe electrical appliances etc. Detriment *'j'* may stand for injuries of different severities, or displacement of compliant product sales, etc. The generalised approach is shown in the equation in Figure 1. Note, though, that some of this value is discounted in the model (using the HMT Green Book discount rate), since the detriment may occur at any point in time over the product's lifespan.

Figure 1 Overarching calculation approach



Caveats to the results of the study

1.7 There are several important caveats that should be considered when interpreting the study's results. Full details are provided in Section 5.

1.8 First, the model relies on multiple data sources, each with inherent limitations. In particular, the likelihood of injury is derived from the Product Safety Database[2] (PSD) risk assessments based on available evidence and expert judgement. PSD data is skewed toward the most severe cases, as these products tend to undergo formal assessments. To avoid overstating detriment, the analysis excludes 'level 4' cases (including fatalities) and applies a cross-product average probability where product-specific data is unavailable. Some other key inputs – such as data from the OPSS Public Attitudes Tracker – are based on self-reported survey data, which may be subject to measurement error.

1.9 Second, results depend on matching datasets with different category definitions (for example, combining PSD probabilities with HSE cost estimates). While the chosen mapping is (in our judgement) the most appropriate possible, the definitions are not fully aligned.

1.10 Finally, several detriments cannot currently be quantified due to the lack of suitable evidence for modelling, including environmental harm and emotional detriment.

[2] The Product Safety Database (PSD) is a notification system to notify unsafe and non-compliant products to the Secretary of State. It provides an oversight of the most reported hazards and the correct actions that have been taken place.

Results

1.11 The full results (detailed breakdown by product category) can be found in the tables in Section 6 of the report - this also includes product specific factsheets and a worked example of how detriment is calculated in the model. As above, the modelling caveats should be considered when interpreting this study's results. The minimum estimated detriment caused (for consumers and businesses) per unsafe product is between £40 and £400 for the majority of product categories OPSS regulates[3]. The minimum detriment caused by one unsafe product varies by category, from £40 for laser pointers to £422 for electrical appliances. Total detriment estimates for each product category modelled is presented in Table 1 below.

Table 1: Per product values of total detriment (Unsafe Products)

Product category	Total Detriment [4]
Chemicals	**£108**
Childcare products	**£345**
Clothing and accessories	**£52**
Construction products	**£97**
Cosmetics	**£51**
Electrical appliances	**£422**
Explosives	**£115**
Food imitation products	**£115**
Furniture and furnishings	**£237**
Gas Appliances	**£211**
Laser pointers	**£40**
Lighting and lighting chains	**£180**
Media, communication, IT equipment	**£292**
Medical products/devices	**£104**
Personal protective equipment	**£151**
Pressure Equipment	**£142**
Recreational Craft	**£179**
Sporting Equipment and Articles	**£79**
Tools and machinery	**£224**
Toys	**£71**
Other Products	**£99**

[3] Figures are reported in 2022 prices.
[4] Figures are reported in 2022 prices.

2 Introduction

Disclaimer

The definitions, risk categories and methodologies in this section are for analytical purposes only and do not replace statutory definitions or legal requirements. PRISM and related frameworks are guidance tools, not legally binding instruments. Risk levels and uncertainty categories are indicative and do not constitute legal determinations. Enforcement decisions must follow applicable legislation and official guidance.

2.1 The Office for Product Safety and Standards (OPSS), part of the Department for Business and Trade, is the UK's national regulator for most consumer products (excluding food, medicines, and vehicles). OPSS works to protect people and places by ensuring that products are safe and meet legal standards, supporting businesses in compliance, and maintaining confidence in the UK's product safety system.

2.2 This project contributes to OPSS's objective of strengthening its evidence base on consumer and business detriment. Specifically, it aims to develop a robust, evidence-based methodology and model to estimate the economic value of removing unsafe and non-compliant products from the UK market. This analysis supports OPSS in assessing the benefits of its regulatory activity and informing future policy and enforcement decisions.

2.3 This project builds on analytical foundations developed by London Economics as part of a research project commissioned by OPSS in 2020. Their work included scoping the relevant detriments, conducting expert interviews, reviewing the literature, undertaking initial data collection, and developing an initial version of the methodology and model. OPSS has since further refined, updated and extended this work, including revising the model structure, refreshing the evidence base and producing the analysis presented in this report.

2.4 Thus, activities undertaken as part of this project include:

- scoping of relevant types of consumers and business detriment;
- consultation with a panel of experts (18 in total, from across 12 organisations, including market surveillance authorities, consumer organisations, industry and academia), via semi-structured interviews;
- a literature review, covering methodologies and applications to measure consumer and business detriment;
- an extensive data review and gathering exercise, covering numerous sources from the UK and other countries; and
- development of a methodology and model to value the consumer and business detriment caused by unsafe and non-compliant products.

2.5 The remainder of this introduction provides important context by reviewing how products are classified as unsafe and non-compliant. Section 3 briefly summarises insights from the literature and Section 4 scopes the detriments. Section 5 summarises how the detriments are modelled (with further details in the Technical Appendix). Section 6 presents the results, including sensitivity analyses. Section 7 provides a forward look and Section 8 (Technical Appendix) provides additional detail to supplement the report.

How products are classified as unsafe and non-compliant

2.6 To address the aims of the project it is important to understand how products are classified as unsafe and non-compliant. Table 19 (Section 8) provides the key definitions drawn from legal terminology and guidance. For analytical purposes we use simplified modelling terms such as 'unsafe' and 'non-compliant' to describe a broad range of issues that may lead to regulatory intervention. These terms used are intended solely to support modelling and subsequent discussion – they do not replace the legal definitions discussed below and in Table 19.

2.7 There are various product safety regulations that determine the characteristics of safe and compliant products. These include the General Product Safety Regulations (GPSR) 2005 and product specific regulations (e.g., the Toys (Safety) Regulations 2011).

2.8 Non-compliance refers to situations where a product does not meet applicable legal requirements, including product safety regulations and related obligations. This does not necessarily mean that the product poses a direct safety risk to consumers. However, compliance is essential to demonstrate adherence to statutory requirements and relevant standards. Some examples of non-compliance may include insufficient labelling, absence of technical documentation or user instructions, or not meeting design specifications set out in legislation or relevant standards.

2.9 Unsafe products are typically considered to be non-compliant. Under the GPSR, a product is deemed unsafe if it presents any risk to health and safety when used under normal or reasonably foreseeable conditions. Non-compliance, however, can also refer to technical breaches – such as missing labelling or documentation – that do not necessarily make the product unsafe.

2.10 Whether a product poses a risk may be assessed against requirements in regulations[5] and harmonised standards (or designated standards post EU exit) or via a risk assessment[6]. In the UK, PRISM Assessment Guidelines[7] are currently used for risk assessments. In line with these guidelines, risk assessments examine the *severity* and *likelihood* of harm. Four severity levels (which are relevant for this study as they provide definitions for the modelling) are defined as follows:

- Severity 1: *"Harm or consequence that after basic treatment (first aid, normally not by a doctor) does not substantially hamper functioning or cause excessive pain; usually the consequences are completely reversible."*
- Severity 2: *"Harm or consequence for which a visit to A&E may be necessary, but in general, hospitalisation is not required. Functioning may be affected for a limited period, not more than about 6 months, and recovery is more or less complete."*
- Severity 3: *"Harm or consequence that normally requires hospitalisation and will affect functioning for more than 6 months or lead to a permanent loss of function."*
- Severity 4: *"Harm or consequence that is or could be fatal, including brain death; consequences that affect reproduction or offspring; severe loss of limbs and/or function, leading to more than approximately 10% of disability."*

[5] For instance, a requirement that toys (and their components) for children under 3 years old must be large enough to prevent swallowing or choking.
[6] A product safety risk assessment is a structured process used by authorities to evaluate the potential harm posed by a consumer product. It involves identifying hazards, estimating the likelihood and severity of harm, and determining the overall level of risk. See: Product Safety Risk Assessment Methodology (PRISM) - GOV.UK
[7] The Product Safety Risk Assessment Methodology (PRISM) is used by market surveillance authorities and enforcing authorities in Great Britain with responsibility for consumer product safety. More information is available here: PRISM Guidance

2.11 The injury scenario is assigned an estimated probability between 1 (certain) to less than 1/1,000,000 (very unlikely). The preferred means of doing so is to use "recognised and reliable probabilities", such as from the European Injury Database or laboratory testing results (EC DG GROW, 2015)[8]. However, the guidelines recognise that there is an inherent uncertainty around probabilities.

2.12 The severity and probability of harm are combined to give a risk level of "Low", "Medium", "High" or "Serious" according to the table below. A low level of uncertainty typically arises when the risk is well understood, has been previously assessed in similar contexts by Market Surveillance Authorities, and/or is supported by relevant evidence. A medium level of uncertainty typically occurs when some relevant data is available, but there are gaps, and/or the evidence is outdated, unvalidated, or otherwise limited. A high level of uncertainty typically arises when there is limited relevant evidence, and the risk is not well understood. This is often the case with novel products or those newly introduced to the market, although such products may have previously been available in other countries before entering the GB market. As shown by the table, the risk level increases as the severity of the injury and the probability of harm increase.

Table 2: Risk levels defined in the PRISM guidelines as a combination likelihood and severity of injury

Probability	Severity 1	Severity 2	Severity 3	Severity 4
Greater than 1/2	*High*	*Serious*	*Serious*	*Serious*
Greater than 1/10	*Medium*	*Serious*	*Serious*	*Serious*
Greater than 1/100	*Medium*	*Serious*	*Serious*	*Serious*
Greater than 1/1,000	*Low*	*High*	*Serious*	*Serious*
Greater than 1/10,000	*Low*	*Medium*	*High*	*Serious*
Greater than 1/100,000	*Low*	*Low*	*Medium*	*High*
Greater than 1/1,000,000	*Low*	*Low*	*Low*	*Medium*
Less than 1/1,000,000	*Low*	*Low*	*Low*	*Low*

Source: PRISM guidelines.

2.13 Following a risk assessment, action should be taken to address risks that are *not tolerable*. According to the Health and Safety Executive (HSE), a *non-tolerable risk* is one that is unacceptable under any circumstances and must be reduced or eliminated regardless of cost[9]. OPSS similarly defines tolerable risk as the acceptability of a perceived risk based on the current values of society[10]. In this context, a non-tolerable risk is one that exceeds what society deems acceptable and cannot be justified by the benefits of the product in question. Deciding on the proportionate action is part of the risk management process, rather than the risk assessment. In the case of 'Serious risk', this must be "rapid intervention", such as withdrawal from the market or recall.

[8] See European Injury Database
[9] See HSE's Tolerability of Risk Framework: [ARCHIVED CONTENT] Risk management: Expert guidance - Reducing risks, protecting people - R2P2
[10] See: OPSS risk lexicon - GOV.UK

2.14 For High and Medium risk, the decision to act may involve professional judgement within the framework of proportionality and statutory obligations. In these cases, the decision of officers will be primarily based on risk tolerability and consumer vulnerability. Assessors (Trading Standards officers, OPSS, regulators or businesses) will make decisions mindful of the total risk that they estimate a product could pose (the PRISM Guidelines do not account for cumulative risk or multiple hazards). Corrective actions should always be proportionate, for example warnings to consumers to inform of the risk and product recalls removing a product from the market. For example, the OPSS risk assessment of water beads led to outcome of medium risk but required a product recall. Further information can be found in the OPSS Incident Management Plan.[11]

2.15 It should be noted that the degree to which the PRISM Guidelines are applied in practice in individual cases may vary. This may depend on officers' experience, available resources, and the need to use those resources efficiently. Furthermore, assigning probabilities in the PRISM tool 'Steps to Harm' to define an injury scenario in the risk assessment requires professional judgement (see paragraph 2.14). Exceptions to this are the assessment of Serious Risk by OPSS, or escalation of an issue to an incident, in which case a standardised response model using PRISM is applied. Nevertheless, the framework set out in the PRISM Guidelines provides a useful reference point to cross-check our modelling results against.

[11] See: OPSS Incident Management Plan - GOV.UK

3 Evidence from the literature

3.1 The aim of the literature review is to present the assumptions and approaches used previously to measure the level of detriment associated with unsafe products. This review has contributed to the development of our methodology to monetise the detriment caused by unsafe and non-compliant products on the UK market.

3.2 The following sections summarise previous research on estimating detriment related to product related injuries and faulty products, as well as studies examining the business impacts of removing unsafe or non-compliant products – particularly in relation to recalls. The core literature review underpinning this section was originally undertaken by London Economics in 2020 as part of a commissioned research project for OPSS (see paragraph 2.3).

Research on product related injuries

3.3 The research in this area outlines the significance of product related injuries. The findings set a rationale as to why estimating product related detriment is necessary.

3.4 Firstly, we will look at various government agencies who focus on product safety, for example, the Australian Competition and Consumer Commission (ACCC) and the US Consumer Product Safety Commission (CPSC).

1) The ACCC estimated the economic cost of deaths and injuries from unsafe products at A$5 billion per year in Australia (equivalent to £2.8 billion[12]). The approach taken by the ACCC multiplies together the number of healthy life years lost, the percentage of product involvement, and the societal value of a healthy life year. The percentage of product involvement is an estimate of the proportion of injuries and fatalities caused by unsafe products provided by Watson and Smith (2006). However, the CPSC (in the US) has taken a different approach, as it developed a cost of injury model which assesses the injuries treated in hospital Emergency Departments (ED). The model accounts for medical costs, work losses, monetised physical and emotional trauma, and litigation costs. Physical and emotional trauma is monetised by estimating the pain and suffering component of awards in liability cases, or compensation the victims receive. The model estimated an average total cost of $6.2 trillion (2014 dollars) associated with medically treated nonfatal consumer-product injuries.
2) Watson and Smith (2006) include the direct cost of hospital and medical treatment borne by the government due to product-related non-intentional injury. The total direct cost of hospital and medical treatment is estimated at A$253m.
3) Another analysis carried out by Lang et al. (2014) looks at the cost associated with minor trauma as the study assumes that focusing only on mortality and major trauma could seriously underestimate the magnitude of total injury burden. The research referred to a state-wide trauma registry in Queensland, Australia, from 2006 to 2010. Over the 5-year period, minor cases accounted for 90% of all traumas included on the Queensland Trauma Registry (QTR). The evaluation of minor trauma cases admitted to hospitals in Queensland required high demands on trauma system

[12] Average exchange rate (GBP/AUD) at 1.837 in 2019

resources such as care bed days, operations, ICU admissions, in-hospital rehabilitation services and patient transportations.

4) Lastly, research carried out by Catchpoole (2015) looks at paediatric injuries due to unsafe products using 4 different studies. Study 1 analyses injury data to identify and quantify product related injuries in the ED using injury-based surveillance data in combination with product related codes. Study 2 provides an in-depth analysis on the ED-based injury surveillance data to examine injury severity and causality. Study 3 looks at hospital admissions data based on frequency, severity and causality. Study 4 analyses retrospective on-site medical records to evaluate the extent of useful documentation in hospital records for product safety stakeholders. The research finds that 35% of all paediatric injuries were caused by product-related injuries. 12% of product-related injuries resulted in hospital admissions and 5% were classified as requiring urgent treatment.

3.5 Shapiro et al (2008) estimate the cost of injuries and fatalities in the US caused by three product categories: Ford SUVs, Baycol, and all-terrain vehicles (ATV), all of which were removed from the market. Shapiro covers medical costs, income, productivity losses, cost of caring for the injured, and costs to children of foregone education. The cumulative cost estimates range from $555 million (for Ford SUVs) to $3.9 billion (for ATVs) in 2007 prices.

3.6 European Commission DG Enterprise and Industry (2012) focus on the reduction in health costs from reducing the amount of lead released by a toy if ingested. This research focuses on the costs associated with Attention Deficit Hyperactivity Disorder (ADHD) and IQ reduction among children, including quality of life, treatment costs and productivity costs. Under the 'no change' scenario, where there is no reduction in lead, the total cost is estimated at €15,144 per child, or €242 billion in total.

Other consequences related to faulty products

3.6 The EU Commission (2017) assesses financial detriment, time loss and psychological detriment for six products and services. The monetised detriment includes the value loss of products, overcharge, and costs incurred to obtain redress. Time loss is monetised using average hourly earnings, and psychological detriment is assessed qualitatively.

3.7 Similarly, BIS (2014) and Citizens Advice (2016) estimate the financial costs, time loss and emotional impact of problems such as delayed delivery and faulty products. Again, time loss is monetised whereas emotional impact is assessed qualitatively. Consumer problems cost UK consumers £22.9 billion in 2015, an average of £446 for every adult (Citizens Advice 2016). BIS (2014) suggest total consumer detriment to be £4.15 billion in 2014 and the average financial loss that consumers incurred to be £223 (an increase from 2012 which was £196).

3.8 Some other studies (KPMG and Lloyds of London, 2020) identify indirect costs to businesses due to product recalls, namely reputational cost and time spent away from productive activities. For the company making a recall, reputational cost is typically estimated as the reduction in its market value. Moreover, reputational damage may also extend to the wider sector.

3.9 The literature also identifies detriment in the form of unfair competition and displacement of sales of safe and compliant products (Australian Government, 2019; Heidhues, 2017). These studies suggest that firms that face higher costs to ensure their products comply with safety requirements are competitively disadvantaged.

Conclusion

3.10 OPSS has developed its methodology (see Section 5) to estimate the detriment associated with unsafe and non-compliant products after reviewing a range of approaches.The methodology of the ACCC and HSE's Cost to Britain model, include the costs of fatal injuries by assigning a monetary value to the loss of quality of life, this report takes a different approach. To ensure results are not overstated due to data limitations and the skewed nature of the PSD dataset, the analysis excludes the highest severity level (fatalities). This ensures the estimates reflect a minimum baseline of detriment, providing a conservative and balanced view of harm arising from unsafe products.

3.11 A limitation of our detriment model is that it does not monetise potential emotional or psychological detriment resulting from product-related harm, which was captured in CPSC's work. It has also not included the wider education costs considered in some academic studies (Shapiro et al., 2008). These omissions reflect the current evidence constraints rather than a lack of importance; they highlight areas where future research and data collection could enhance the model's comprehensiveness.

4 Scoping of detriments

4.1 This section scopes out the consumer and business detriments that are avoided due to unsafe and non-compliant products being removed from the UK supply chain. The detriments have been identified through experts within OPSS and the expert panel and by examining the hazards associated with unsafe products recorded in the Safety Gate database[13]. The panel were invited by London Economics (as part of the commissioned research – see paragraph 2.3) to comment on preliminary lists of consumer and business detriments and generally agreed with these detriments. Section 5 summarises how the detriments included in the model are estimated.

4.2 Three overarching points to note regarding the detriments are that:

- **We use the terms unsafe and non-compliant to reflect a broad range of product issues that may lead to regulatory intervention; these terms do not replace statutory definitions**. We acknowledge that not all forms of non-compliance necessarily result in a risk of injury or harm. However, for modelling purposes, we have made simplifying assumptions to estimate the potential detriment an unsafe or non-compliant product can cause. **These assumptions are intended to support analytical clarity and do not imply that all non-compliant products pose a direct safety risk.**
- None of these detriments occur with 100% certainty for every unsafe or non-compliant product that enters the supply chain. For example, not every unsafe product will cause an injury, nor will every non-compliant product necessarily lead to harm. This has important implications for the modelling as it implies that the model must have a significant probabilistic element to reflect the varying likelihood of different detriments occurring.
- There are potential overlaps between some consumer detriments and business detriments. For example, the costs of damage to property may be borne by consumers or insurance companies. To prevent double counting, the modelling approach ensures that such detriments are only attributed once, to a single stakeholder group wherever possible[14].

Consumer detriments

4.3 Consumer detriments arising from unsafe and non-compliant products include:

- physical harm to consumers;
- damage to property;
- cost of replacing the product due to (i) physical harm and (ii) damage to property;
- time loss due to (i) physical harm and (ii) damage to property; and,
- time loss due to product recalls.

4.4 The consumer detriments are product-related harms that may occur to consumers and have financial costs (e.g., expenses) and/or non-financial impacts (e.g., pain and psychological harm). These include harms caused by unsafe and non-compliant products being in consumers' possession, such as **physical harm** to consumers and

[13] The Safety Gate system facilitates the rapid exchange of information on dangerous products among EU member states and the European Commission: https://ec.europa.eu/safety-gate-alerts/screen/search
[14] There are two situations where double counting could occur – refer to the Modelling Caveats in Section 5.

property damage. Physical harm encompasses a range of potential injuries (e.g., cuts, bruises, electric shocks, burns and damage to hearing or sight). Damage to property includes damage to buildings and personal possessions, such that products can no longer be safely used. It does not include damage arising from normal wear and tear, consumer misuse, or deterioration over time. It should be noted that psychological, environmental, and financial harms are not currently assessed on a scale using PRISM, which only provides a scale of harm for physical injury to the person.

4.5 Physical harm to the person can vary significantly in terms of severity. As noted in paragraph 2.10, PRISM Guidelines classify the severity of physical injuries according to four levels. These are based on the extent of medical attention required, the length of time the functioning of the human body is affected and the reversibility (or irreversibility) of the consequences. These classifications are important since they are used within enforcement guidance to determine a proportionate corrective action, based on the possible level of harm.

4.6 In addition, the detriments also include costs that arise when an unsafe product is discovered in a consumer's possession and the situation must be remedied. An unsafe product may be found because it causes an incident (e.g., physical harm or property damage) or due to an intervention such as a recall that has been prompted by an identification of a non-compliance without an injury to the person or other detrimental harm having occurred. The consumer detriments that would then arise include the financial **cost of replacing the product** (or repairing it) and the **time lost** for the consumer dealing with the problem.

4.7 Further potential detriments include **lost income** and **emotional detriment**, both of which may arise due to physical harm or time spent dealing with a problem. Lost Income is modelled for lost income earning hours whilst replacing a product and for lost income arising due to physical harm.

4.8 Emotional detriment is not included in the model due to the absence of a robust and reliable method of quantifying it. We acknowledge that such emotional detriment is real and can be significant. For example, the CPSC incorporates compensation awards in liability cases as a proxy for emotional harm. Similarly, other studies[15], have attempted to account for broader impacts like forgone education for children. These examples highlight areas of potential underestimation of consumer detriment in our model, which focuses on quantifiable and evidence-based detriments.

4.9 Finally, one further detriment, which is also not included in the model due to a lack of reliable data and because this is not currently assessed on a scale of severity using PRISM[16], is **environmental damage** (e.g., release of pollutants by products).

4.10 The expert panel generally agreed with these detriments. The experts commented that injuries and illnesses can lead to a range of financial and non-financial costs, some of which are modelled in existing injury-cost models.[17] For consumers these include pain, suffering and lost earnings.

[15] See Shapiro et al. (2008) study here: https://onlinelibrary.wiley.com/doi/10.1002/jclp.20491
[16] Using PRISM, environmental damage can be considered in the Risk Evaluation stage of the Risk Assessment.
[17] See Australian Government (2019), Pacific Institute for Research and Evaluation (2018) and Food Standards Agency (2020)

Business detriments

4.11 Business detriments arising from unsafe and non-compliant products include:

- lost revenue due to displacement of compliant products by unsafe and non-compliant products;
- insurance claims for property damage;
- costs due to workers being absent as a result of injuries or illness;
- reputational damage to businesses directly involved or the wider industry; and
- costs of product recalls, including the costs of investigating the issue, communicating with the public, refunding customers or replacing products, and legal advice.

4.12 For modelling purposes, we assume the first three detriments above (lost revenue due to displacement of compliant products, insurance claims and costs due to workers being absent) typically affect businesses that supply compliant products, while the latter two detriments (reputational damage and costs of product recalls) may arise for businesses whose products are found to be unsafe or non-compliant. It is important to note that the presence of a non-compliant product does not necessarily imply intentional wrongdoing or that the business as a whole, is non-compliant**. For analytical purposes, we focus on the characteristics of the products themselves, recognising that non-compliance can occur for a range of reasons, including unintentional errors or supply chain issues.**

4.13 The first detriment above (lost revenue due to displacement of compliant products) refers to the fact that, if available in the market, unsafe and non-compliant imports may displace sales of compliant products. A straight-forward way to think about this is to assume that each unsafe or non-compliant product entering the market results in one less compliant product sale. We refer to this the 1-for-1 (displacement) assumption (see paragraph 5.28).

4.14 The expert panel agreed that competition between unsafe or non-compliant products and compliant ones is plausible, leading to potential displacement of compliant products. It may not be immediately obvious to consumers that products are unsafe or non-compliant, which would intensify competition from these products. According to research by Electrical Safety First, around a third of UK residents have purchased a counterfeit electrical product through an online marketplace.[18]

4.15 It is reasonable to assume that unsafe or non-compliant products can displace products meeting regulatory safety requirements. This is because one could argue that these products could be lower priced, as ensuring that products comply with safety requirements may be expected to lead to additional costs.

4.16 Most of the expert panel agreed that the 1-for-1 assumption is tenable for the modelling. Therefore, it is used for the central scenario in the model. Several considerations were raised by some experts regarding the 1-for-1 assumption.

- Firstly, the extent that unsafe or non-compliant products will compete with compliant ones, or instead be vertically differentiated, is uncertain.
- Secondly, the displacement of compliant products may deter compliant suppliers, whereas removing unsafe or non-compliant products may deter such products from entering in the first place.

[18] See Electrical Safety First Report (2018).

4.17 Thus, there may be a deterrence multiplier effect. These two arguments would mean the 1-for-1 displacement assumption could be an over or underestimate, respectively. Hence, the sensitivity analysis includes alternative assumptions for the displacement effect (paragraphs 6.51 to 6.53). Note that the model's analytical approach does not seek to describe or predict actual market behaviour.

4.18 **Reputational damage** is the only business detriment that does not have a *direct* financial cost to businesses (i.e., lost revenue or expenses). However, it would be expected to *indirectly* result in financial losses via reduced sales due to negative public perception. The expert panel broadly agreed that reputational damage, while not a direct monetary cost, would have financial implications for businesses. The extent of the damage would depend on how the business responds - proactive mitigation efforts, such as public relations strategies or product recalls, may limit long-term financial impact, while inadequate handling could amplify losses.

4.19 Although reputational damage has the potential to affect the wider sector or industry, the extent of such wider damage is likely to be highly context specific. That said, one industry expert provided us with evidence from an affected business, which showed evidence of the significant impact that reputational damage can have. In recent years, the reputation of e-bikes in the UK has come under scrutiny due to a rise in incidents involving illegal or modified models, particularly within the gig economy. These e-bikes, which often exceed legal speed and power limits, have been linked to safety hazards such as battery fires and road accidents. According to OPSS, there has been a steady increase in fire incidents involving e-bikes and e-scooters, primarily due to lithium-ion battery failures[19]. The All-Party Parliamentary Group for Cycling and Walking (APPGCW) has reported that many of these incidents stem from poor-quality imports and non-compliant conversion kits[20]. Media coverage has, at times, amplified public concern by failing to distinguish between these unsafe variants and legally compliant e-bikes[21]. This has contributed to a generalised perception of e-bikes as unsafe, despite their recognised benefits for sustainable urban transport. In response, industry bodies and advocacy groups have launched initiatives to educate consumers, promote safety standards, and restore public confidence. This example illustrates how reputational damage, even when stemming from a subset of non-compliant products, can affect perceptions of an entire product category.

4.20 Regarding the costs of recalls, according to an industry expert some costs are fixed while others vary depending on the number of units. The costs may fall on different parties depending on the scenario. Often it will be the manufacturer, especially if it is a reputable manufacturer. Therefore, we treat recall costs as a business detriment. It is important to state that occasionally, the retailer may bear some costs, although these are likely to be relatively small (according to the expert panel). However, if the product is imported through an untraceable supply chain the costs may be borne by a local importer or distributor or the consumer.

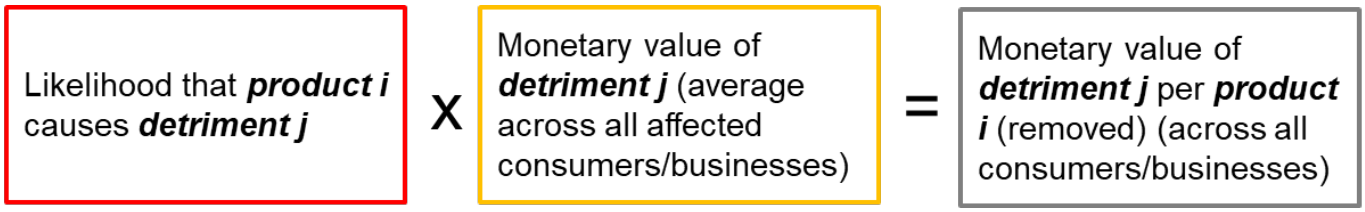
[19] Fires in e-bikes and e-scooters – 2024 - GOV.UK
[20] The full report is available here: https://appgcw.org/resources/inquiries/unregulated-and-unsafe--the-threat-of-illegal-e-bikes/
[21] E-bike battery fires 'tearing through homes' - charity

5 Methodology

Overarching approach

5.1 At the highest level, the model estimates the detriment caused per unsafe or non-compliant product by combining two components: (i) the likelihood that the product could cause a given detriment, and (ii) the monetary value of that detriment. This overarching calculation is illustrated in Figure 1 and applies consistently across all product categories and detriment types.

Figure 1 Overarching calculation approach



5.2 Formally, the per-product value of detriment for product type *'i'* and detriment type *'j'* is calculated by multiplying the probability that *'i'* causes *'j'* by the monetary value of *'j'* across affected consumers or businesses. This value is then discounted in line with HMT Green Book guidance to reflect that detriment may occur over the product's lifespan.

5.3 The detriments are modelled for 21 product categories, including, for example, childcare products, electrical appliances, and toys. A key principle in the modelling is that we have sought to produce a minimum estimate of detriment. Where there was a choice of assumptions, we consistently erred on the side of underestimation rather than overestimation. For example, level 4 injuries (fatalities and the most severe cases) were excluded to avoid inflating results (see modelling caveats in Section 5), and cross-product average injury probabilities are used where data are sparse. This ensures that results present a conservative and credible baseline.

Scope of the modelling

5.4 The model estimates the value of the detriments outlined in Section 4 (see paragraphs 4.3 and 4.11). Some of the detriments are modelled for multiple severity levels. The highest severity level (Level 4) is excluded from the analysis due to the inherent skew in the PSD data towards the most serious injuries (see Section 5 for a detailed explanation). This adjustment ensures that the resulting estimates provide a more balanced and representative view of detriment, focusing on a minimum detriment baseline.

5.5 Other detriments (i.e., those due to recalls and the displacement of compliant product sales) are modelled for just one severity level.

5.6 All monetary estimates presented in this report are expressed in 2022 prices. This reflects the fact that the majority of the underlying datasets used in the modelling – particularly those extracted in late 2023 – report values in, or most closely aligned to, 2022 price levels. To ensure internal consistency across all elements of the analysis, we have converted all inputs to 2022 prices using the ONS Consumer Prices Index (CPI) as the inflator. Using a single, recent price base avoids mixing estimates from different.

years and provides a coherent basis for comparing detriment values across product categories.

5.7 The detriments are modelled for 21 product categories. The full list of product categories modelled and the rationale for including them is provided in the Technical Appendix. The findings in this report (Section 6) discuss the estimated detriment for product categories where there is evidence in the data (either the PSD or data on products intercepted at the UK's borders) of these products being removed.

5.8 Every product category has been ranked into three severity levels ranging from level 1 being basic treatment needed (e.g. first aid), level 2 that may require a visit to accident and emergency (A&E) and level 3 that would require hospitalisation. Level 4 would be life threatening injuries, but this level has been excluded from the study.

Consumer detriment calculations

5.9 For each consumer detriment discussed below, Section 6 presents a worked example illustrating how the model estimates detriment. This example walks through the step-by-step calculation process, showing how the general approach outlined in Figure 1 is applied in practice. It demonstrates how consumer detriments combine to provide an overall consumer detriment estimate.

Physical harms (injuries, illnesses and fatalities)

5.10 Unsafe and non-compliant products can lead to physical harm such as injuries and illnesses. The model distinguishes three levels of severity based on the injury classification in the PRISM Guidelines (see paragraph 5.12).

5.11 The model uses the injury cost estimates from the Health and Safety Executive (HSE) Cost to Britain methodology. The estimates used are the "human" costs defined as *"representing a monetary estimate of the loss of quality of life, and loss of life in the case of fatal injuries".* Despite being relevant to workplace injuries, these human costs are relevant for injuries occurring in other settings (e.g., at home), since the loss of quality of life from an injury would not vary depending on where it is sustained. (NB, "human" costs do **not** include sick pay payments to injured consumers. Sick pay is instead counted as a cost to businesses (paragraph 5.32) and loss of income for injured individuals is included in HSE's cost model under financial costs to individuals. [22]

5.12 Matching some datasets requires subjective judgement. In this case, judgement has been used to make an appropriate match between the injury classifications used for the PRISM Guidelines and the HSE costs, based on the types of costs measured and definitions of classifications used in both datasets. The "human" costs are provided for three injury classes, which are defined below:

- level 1 physical harm corresponds to the HSE human cost associated with an injury requiring up to 6 days off work;
- level 2 physical harm corresponds to the HSE human cost associated with the average non-fatal injury;
- level 3 physical harm corresponds to the HSE human cost associated with an injury requiring 7 or more days off work.

[22] See the HSE methodology: [ARCHIVED CONTENT] HSE: Economics of Health and safety - Appraisal values or 'unit costs'

5.13 The model multiplies the HSE costs by the estimated probabilities of physical harm caused by unsafe and non-compliant products at each severity level. These probabilities are estimated based on the product-specific risk assessments registered in the Product Safety Database (PSD).[23] Further details are provided in the Technical Appendix.

5.14 We also conducted sensitivity analysis around the estimation of PSD probabilities. The results of this are presented in Section 6.

Damage to property

5.15 Unsafe and non-compliant products have the potential to cause various types of damage to property, for example by causing a fire. Since the severity of damage can differ across incidents, in the model we distinguish three severity levels: low (level 1), medium (level 2) and high (level 3). These levels are defined based on the monetary value of the damage caused, using cost estimates from the OPSS Public Attitudes Tracker dataset (PAT).[24]

5.16 Severity level 1 damage is defined as damage costing between £0 and £100. The average cost[25] for consumers in this category is **£49.**

5.17 Severity level 2 damage is defined as damage costing between £100 and £400. The average cost[26] for consumers in this category is **£238.**

5.18 Severity level 3 property damage is defined as damage costing over £400. The **average total** amount, for consumers and insurers combined is £4,700. Therefore, to calculate how much of this total amount[27.] (for severity level 3 property damage) consumers incur, we use a weighted average of the cost borne by consumers who *successfully make an insurance claim and those who do not receive an insurance payout*, which equals **£2,217.**

5.19 To calculate the probability of property damage of a given severity level caused by unsafe and non-compliant products, we combine two probabilities calculated from the PAT data. These are the likelihood that an unsafe product causes property damage, and the likelihood that this damage is of the relevant severity level (i.e., cost)[28]. Property damage estimates for laser pointers and recreational craft have been set to zero and excluded from the model, as we have assumed it would be very unlikely for these types of products to cause property damage (in a residential home). For 9 product categories, category-specific probabilities can be calculated from the data. For the other 12 product categories, the cross-product average is used due to a lack of data.

5.20 Finally, to estimate the per product value of property damage at a given severity level, we multiply the relevant probability by the relevant monetary value. Worked examples of model calculations are presented in Section 6.

Cost of replacing products

5.21 A potential consequence of unsafe and non-compliant products causing physical harm or property damage to consumers is the need to replace the product that caused it. Hence, we assume that following an incident of physical harm or property damage, consumers will replace the product that caused it, only *if the product is an essential*

[23] See OPSS Guidance: https://www.gov.uk/guidance/product-safety-database-unsafe-products
[24] The PAT survey available here: BEIS Public Attitudes Tracker: Autumn 2022 - GOV.UK
[25] In 2022 prices.
[26] As above, in 2022 prices
[27] As above, in 2022 prices
[28] Ibid.

item[29]. Using estimates of the shares of products that are non-essential from BIS (2014)[30], we obtain the share of products that are essential. Thus, the likelihood that this detriment occurs is the probability that a product causes physical harm or property damage, multiplied by the probability that the product is essential.

5.22 For each product category, an estimate of the average selling price of a single product is used as the cost of replacing it (i.e., the monetary value of the detriment). Depending on the data available for each product category modelled, one of three data sources were used to estimate the selling price: Statista Consumer Market Outlook, ONS PRODCOM Manufacturers' Sales data, or a web-sweep of prices.[31] We detail these estimations in the Technical Appendix.

5.23 To obtain the value of detriment, the average selling price is multiplied by the likelihood that the detriment occurs. We also conduct sensitivity analysis around the proportion of consumers replacing non-essential products. The results of this are presented in Section 6.

Time loss

5.24 Replacing a product that has caused physical harm or property damage will all result in time loss for the consumer. Likewise, so will being involved in a product recall. Thus, we model the monetary value of time loss from these three sources.

5.25 To model these detriments, we first calculate the cross-product average estimate of the monetary value of time loss per problem (£79.03[32]). The Technical Appendix provides details of this calculation using a Citizens Advice study (paragraph 8.19). Then we multiply this monetary value by the relevant probability of time loss due to replacing the product or a product recall.

Business detriments calculations

5.26 For each business detriment discussed below, Section 6 presents a worked example illustrating how the model estimates detriment. It demonstrates how business detriments combine to provide an overall business detriment estimate.

Displacement of compliant product sales

5.27 If allowed onto the market, unsafe and non-compliant products could compete with compliant products. This could reduce the market share and revenue of the businesses supplying compliant products. Thus, the model includes lost revenue due to displaced sales of compliant products as a business detriment.

5.28 Since data on the rate of displacement is limited, we assume that each unsafe or non-compliant product sold to a consumer result in one less compliant product sale. We refer to this as our **1-for-1 (displacement) assumption**. In other words, the probability that an unsafe or non-compliant product displaces a sale is assumed to be **100%**. This assumption is necessary for modelling purposes, as it provides a structured way to estimate displacement in the absence of data.

---

[29] In the sensitivity analysis (fully described in the Technical Appendix) we expand this assumption to account for consumers who replace the product if the product is non-essential too.
[30] The cross-product average of non-essential items is 55% - by subtracting these shares from one, we obtain the shares of products that are essential.
[31] Where available, prices calculated from Statista's Consumer Market Outlook are prioritised. The reason for this is that this data best reflects the variety of retail prices across the different products within the product category and the different retailers that will sell the product. Where this data is not available, gaps are filled using either calculated prices from the PRODCOM data or the median prices from the web-sweep.
[32] Original estimate of £72.94 (2019 prices) is inflated to 2022 prices using the ONS CPI Index.

5.29 To value this detriment, this probability is multiplied by an estimate of the average selling price of a single unit for each product category. For any calculation (for any detriment) in the methodology that uses product prices, these prices are based on *three data sources (Statista, ONS and a web-sweep of prices),* as explained in the Technical Appendix.

5.30 Given the uncertainty around the 1-for-1 assumption, we also conduct sensitivity analysis (in Section 6) around this assumption as a robustness check on how results change when the assumption is altered.

Business costs of absent workers

5.31 When a product causes physical harm to an individual, businesses may incur costs from their employees being absent from work.

5.32 The business costs estimated in the model are sick pay payments for sick workers and "production disturbance" costs associated with staff reorganisation and recruitment. The model uses estimates from HSE's Cost to Britain methodology. While these cost estimates relate to workplace injuries, they are likely to be comparable to those from injuries occurring in other settings (e.g., at home). Businesses must pay (at least statutory) sick pay to employees regardless of where the injury occurred. Any absent worker, regardless of where their absence arose, will incur production disturbance costs, regardless of the reason of their absence.

5.33 Therefore, we multiply these HSE costs by the likelihood that businesses incur costs from absent workers. Since this detriment would only arise due to physical harm to individuals in employment, this likelihood is given by the probability that physical harm occurs (at three severity levels, discussed in paragraph 5.12), multiplied by the share of the population who are employed (48.85%) estimated using ONS population and employment statistics[33,34].

Reputational damage from physical harm to consumers

5.34 A potential consequence of unsafe products causing physical harm to consumers is reputational damage for businesses involved – leading to financial detriment for these businesses. In particular, the business that supplied the product in question may experience lower sales and reduced market value. In some circumstances, the wider industry may also be affected. The extent of reputational damage depends on several factors including how long any reputational damage lasts, the number of consumers harmed, and the business' response.

5.35 Given these uncertainties around the size of reputational damage and the wider impacts that could arise, a conservative approach is taken to value it. The approach estimates the lost revenue for businesses due to consumers who have experienced physical harm caused by an unsafe or non-compliant product **no longer repurchasing** that product (i.e., there is a lost future purchase).

5.36 An estimate of the average selling price of a single product for each product category is used as the monetary value of lost revenue associated with reputational damage from physical harm. To estimate the cost of lost revenue, the average selling price is multiplied by the likelihood that the detriment occurs. This likelihood is given by the probability that physical harm occurs (discussed in paragraph 5.51) multiplied by the share of products that are discretionary (i.e. non-essential) items (BIS (2014)).

[33] Population estimates from the ONS available at:
https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates
[34] Employment estimates from the ONS available at:
https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/timeseries/mgrz/lms

5.37 Therefore, we assume that if someone experiences physical harm from a product and that product is non-essential, they will not purchase it again. In other words, if the product is deemed essential, the consumer will purchase it again and there is no lost revenue from reputation damage to businesses overall.

5.38 This approach to measure reputational damage only captures lost future sales (to businesses) due to consumers who have experienced physical harm, but not the possible wider impact among other consumers. While a wider impact is likely to exist (and is discussed qualitatively above), it is not included in the model since we found no reliable way of estimating it quantitatively.

5.39 Moreover, the methodology also considers only one repurchase at the end of the product lifetime. While this is another reason why the estimate may be conservative, it reflects the transient nature of reputational damage (evidenced by Yu-Yen (2018) and Rayner (2004)).

Reputational damage from damage to property

5.40 Reputational damage may also arise when consumers experience damage to their property caused by unsafe and non-compliant products. The approach for this detriment estimates lost revenue due to consumers who have experienced property damage no longer repurchasing the product (i.e. a future sale is lost). The approach is equivalent to that for reputational damage from physical harm to consumers, so the caveats regarding the estimate being conservative apply (discussed in paragraph 5.35).

5.41 Again, an estimate of the average selling price of a single product for each product category is used as the monetary value of lost revenue. This is multiplied by the likelihood that the detriment occurs. This likelihood is given by the probability that property damage occurs (discussed in paragraph 5.51) multiplied by the share of products that are essential. That is, we assume that if someone experiences property damage from a product and that product is a non-essential item, they will not purchase it again.

5.42 Note that this may be a potential source of double counting because an individual may suffer both an injury and property damage, in which reputational damage arising from these events would be counted twice. However, the proportion of consumers who suffer injuries **and** property damage **together** is unknown, so we are unable to estimate the size of this group and deduct detriment accordingly.

Insurance payouts for damage to property

5.43 For consumers who have a home insurance policy and make a successful claim, the cost of property damage is passed to their insurer. Therefore, some of the costs of property damage are counted as a business detriment in the model.

5.44 Consumers who successfully make an insurance claim will still need to pay the excess of their policy. While no estimates are available for the average excess for home insurance policies, £400 is used in our modelling, based on indicative examples of "escape of water" and "accidental damage" excesses provided by a leading comparison website.[35]

5.45 An insurer would only make a payout where the value of damage is greater than £400. This value of damage also corresponds to severity level 3 for the *damage to property* consumer detriment. Therefore, the likelihood that an insurer will pay out for damage to

[35] Source: https://www.comparethemarket.com/home-insurance/content/excess/

property caused by an unsafe or non-compliant product is the same as the likelihood that the product causes severity level 3 property damage. In other words, we assume consumers who suffer property damage of level 1 or 2 would not make an insurance claim (since the level of damage is less than the excess) and bear the full cost of damage. This approach ensures costs are not double counted on the business and consumer side of detriment.

5.46 The likelihood of detriment is multiplied by its monetary value. The average total cost[36], for consumers and insurers combined is £4,700. To calculate how much of this total amount insurers incur, we use the average cost borne by insurers when consumers successfully make an insurance claim. This is adjusted to account for instances where the insurer would not pay, and the total amount would be paid in full by the consumer (either because they do not have insurance or do not make a successful claim). The resulting monetary value is £2,217 (for all product categories)[37].

Costs to businesses of a recall

5.47 If unsafe and non-compliant products that get into circulation are discovered and must be recalled, this results in a cost to businesses. Some of these costs will be direct financial costs to the relevant businesses. These include costs of investigating the issue, communicating with the public, refunding customers (or replacing or modifying products), legal fees and liability, and settlement costs (see the literature review). We assume that supply chains are traceable so the costs of a recall fall on businesses within the relevant supply chain.

5.48 Due to very limited recall cost data, we use information from a recall of washing machines by Whirlpool. This recall resulted in (per unit) costs to the manufacturer equivalent to **45.6%** of the average selling price (see the Technical Appendix for details). As discussed in greater detail in paragraphs 8.25 to 8.27, a limitation of this extrapolation is that the cost associated with this recall does not represent all other recalls.

5.49 This monetary value (45.6% of the average selling price) is multiplied by the likelihood of the detriment. This likelihood is the probability that an unsafe or non-compliant product is discovered in circulation, and a recall is initiated within the product's lifetime. The US CPSC estimates that **46%** of cases they receive lead to a recall (CPSC, 2017) and this figure is used as a proxy. To make modelling possible, we assume that all products that are recalled will be corrected i.e. we assume a 100% participation in the recall exercise. In Section 6, the results of a sensitivity test, conducted on this likelihood to test the suitability of this proxy, are presented.

Reputational damage from a recall

5.50 A further potential impact of a product recall on businesses is reputational damage among consumers. For this detriment, we use a similar approach as that used to value reputational damage from physical harm to consumers and property damage (covered in paragraphs 5.34 to 5.42). That is, we estimate the value of lost future sales to consumers who experience a recall (for one round of repurchase). In other words, mirroring the other reputational damage detriments, we assume that if someone experiences a product recall for a product they own and that product is non-essential, they will not purchase it again (i.e. a future sale is lost).

[36] This is the total of the excess and the average home insurance payout from the Association of British Insurers
[37] In 2022 prices

5.51 An estimate of the average selling price of a single product for each product category is used as the monetary value of lost revenue. This is multiplied by the likelihood that the detriment occurs. In the model this likelihood is the product of three components:

- the probability that a product recall is initiated for the product within its lifetime (46% from CPSC, 2017); multiplied by,
- a product-specific value for the likelihood that a consumer engages with a recall (such as by returning the product); multiplied by,
- the share of products that are discretionary (i.e., non-essential) items.

Modelling caveats

5.52 There are several caveats that must be considered when interpreting the study's results. These centre around three overarching issues, namely data limitations, data matching methods and the modelling scope. This section summarises the three key issues and links them to the more in-depth discussion that follows.

5.53 **Data limitations.** The model relies on multiple data sources that vary in completeness, representativeness and methodological robustness. The PSD, which provides estimates of the likelihood of injury, is known to be skewed toward higher-severity products, as these are more likely to undergo risk assessments[38] and take priority when resources are finite. Therefore, products causing lower-level injuries are more likely to be underrepresented. To avoid overstating detriment, the model excludes all Level 4 harms (the most severe cases, including fatalities) and applies a minimum detriment baseline. As a result, the total detriment estimates exclude the monetisation of the most serious injuries and are likely to be conservative. For many product categories, limited PSD data means the model uses cross-product average injury probabilities, which may lead to some over- or under-estimation at product category level.

5.54 **Data matching methods**. The model combines information from multiple datasets that use different definitions, category structures and severity classifications. This required subjective judgement when aligning data across sources. A key example is the mapping between PSD injury severities and HSE monetary values. Although the mapping adopted is the most appropriate available, the definitions do not perfectly align.

5.55 **Modelling scope**. Several detriments could not be quantified due to data unavailability, including environmental damage and emotional harm. In addition, as noted above, level 4 injury have been excluded to provide a minimum detriment baseline. As such, the total detriment estimates presented in this report should be interpreted as conservative.

Detailed caveats

5.56 An extensive data review and data gathering exercise was conducted to assemble data for modelling purposes. However, while the data has been drawn from the most appropriate and reliable sources found, there are nevertheless potential problems affecting the accuracy of data inputs. These limitations are discussed in detail below.

Product Safety Database (PSD)

5.57 The PSD is a key dataset for the modelling as it provides values (from risk assessments) for the probabilities that unsafe or non-compliant products cause physical

[38] A product safety risk assessment is a structured process used by authorities to evaluate the potential harm posed by a consumer product. It involves identifying hazards, estimating the likelihood and severity of harm, and determining the overall level of risk. See: Product Safety Risk Assessment Methodology (PRISM) - GOV.UK

harm to consumers. These likelihoods are determined based on available evidence and in the absence of data, the best subjective judgment of the assessor. For the current modelling, these values are replaced with the whole sample averages of the reliable probabilities for the relevant severity level and as explained earlier, the study excludes cases from the PSD classified as the highest level of injury (including fatalities).

5.58 Product category-specific probabilities are calculated from the PSD data if at least 10 datapoints are available for the relevant product category. This threshold of 10 datapoints is set to ensure that probabilities are not based on one or two datapoints, which would not provide a representative or robust estimate for the category. That said, this approach does not fully eliminate the risk of unrepresentative estimates, particularly for product categories that encompass a wide variety of products with differing characteristics.

5.59 Moreover, where the 10 datapoint threshold has not been met, means that for most product categories the cross-product average probability of injury must be used. This means that the estimated values of detriment are more homogeneous (less variable) across product categories. For some product categories the estimated value of the physical harm will be underestimated, whereas for other categories it will be overestimated. Due to missing data, for non-compliant products, the cross product average probability of severity level 2 injuries is 0%.

5.60 Finally, it is necessary to assume or impute the probabilities of physical harm for each of the severity levels *not* identified in the PSD. In our central scenario, if the probability of injury is identified as a certain percentage at severity level 3 but there is no information for levels 1 and 2, we assume the same probability for the other levels. The rationale is that if an injury occurs at level 3, it should be at least as likely to occur at lower severity levels. We conduct sensitivity analysis on the likelihood of injury to test the suitability of this assumption.

Public Attitudes Tracker (PAT) data

5.61 The PAT data used to derive the probabilities and costs of property damage are based on consumers' experiences and their self-reported survey responses. Hence, this data may be subject to misreporting error.

5.62 The products about which respondents are answering in the survey may not align with what a risk assessor would classify as unsafe or non-compliant based on the risk assessment guidelines. In addition, the PAT data does not distinguish between them, for modelling purposes, the same figures from this source are used for both unsafe and non-compliant products. In reality, the probability of causing property damage will likely differ between unsafe and non-compliant products (specifically, one might expect the probability to be higher for the former).

5.63 Finally, low sample sizes mean that cross-product averages are used for some product categories (like for the probabilities from the PSD). The use of cross-product averages mean that product categories are more likely to be treated as homogenous for the purpose of modelling property damage.[39]

[39] The following product categories that have their own specific probabilities are childcare products, clothing and accessories, cosmetics, electrical appliances, furniture and furnishings, media, communication and IT equipment, sporting equipment and articles, tools and machinery and toys. The other categories use a cross-product average.

BIS (2014) Consumer Engagement and Detriment Survey

5.64 The BIS (2014) Consumer Engagement and Detriment Survey asks consumers whether problematic products and services are essential to the consumer. This is used in the calculation of the likelihood that a consumer replaces an unsafe or non-compliant product. The survey covers a wide range of problematic products and services, including faulty products, inadequate redress, late delivery, and substandard service. Thus, data from the survey may not necessarily be representative of products exclusively regulated by OPSS. The BIS study is also dated which may limit its relevance to current consumer behaviour and market conditions.

5.65 In addition, like the PAT data (discussed above), the BIS survey data is based on consumers' self-reported survey responses and so may be subject to misreporting error.

Product price data

5.66 The modelling of several detriments relies on estimates of product prices. Attributing an average price to the products within each product category used in the model is a difficult challenge for these detriments. As noted in paragraph 5.22, for each product category one of three data sources may be used to estimate the average selling price: Statista, ONS PRODCOM, or a manual web-sweep of prices.

5.67 Given the diversity of products within the "Construction Products" and "Other products" categories, it was not possible to find sensible estimates of the average selling prices for these categories. Therefore, for these two categories, it was not possible to include several detriments involving the average selling price in their calculations. The detriments that are not included are displacement of compliant product sales, reputational costs of injury, reputational costs of damage to property, cost to businesses of recalls, reputational costs of recall, cost of replacing the product due to property damage and cost of replacing the product due to injury. As a result, the total detriment estimates for "Construction Products" and "Other Products" are likely to be understated, since several detriments could not be modelled due to their reliance on average selling price data.

5.68 The Statista data is used where it is available, as it best reflects the variety of retail prices across the different products within each product category. Where Statista data is not available, the PRODCOM data is used. This data has the drawback that it is based on manufacturers' sales data and so reflects manufacturers' prices (not prices to final consumers). Where neither Statista nor PRODCOM data are available, the web-sweep data is used[40]. However, this data has several limitations. It is based on prices from one large online retailer's platform, a limited number of types of products within each category, and a limited number of datapoints per category (see paragraph 8.14).

Citizens Advice estimate of lost time

5.69 Citizens Advice's 2016 report *'Consumer detriment: counting the cost of consumer problems'*[41] provides an estimate of the average amount of time spent resolving each consumer problem. In the model, this is used as a proxy for the time required to replace a product that is found to be unsafe or non-compliant (following physical harm, property damage, or a recall). The Citizens Advice report allows this lost time to be divided in

[40] Web-sweep prices data is used for the following product categories: chemicals, childcare products, cosmetics, explosives, food imitation products, gas appliances, laser pointers, pressure equipment, sporting equipment and articles and tools and machinery.
[41] Source: Citizens Advice's 2016 report 'Consumer detriment: counting the cost of the consumer problems'

leisure time, work time associated with lost earnings, and other work time. It is multiplied by the hourly value of time to obtain its monetary value (see paragraph 8.17).

5.70 The Citizens Advice estimate of lost time is based on a survey of consumers and so may be subject to misreporting error. The estimate corresponds to the average time lost due to a range of consumer problems, which does not necessarily reflect the time that would be lost replacing a product. Furthermore, the study is somewhat dated, and recent developments in digital technology may have streamlined product replacement and recall processes since its publication - this could mean the time lost is overestimated. Nonetheless, in the absence of more recent data, it remains the best available proxy for estimating time lost in replacing unsafe or non-compliant products.

Probability that an unsafe or non-compliant product is found and recalled

5.71 The probability that an unsafe or non-compliant product is found and recalled is a modelling parameter that is essentially unknown. As noted in paragraph 5.49, the US CPSC's estimate that 46% of cases they receive lead to a recall is used as a proxy for this parameter in the central modelling scenario.

5.72 However, since not all unsafe and non-compliant products will come to the attention of market surveillance authorities, this figure is likely to be an overestimate (to an unknown extent), as we cannot know the proportion of unsafe products that go unreported.

5.73 From the PAT survey, information is available on actions that consumers took when they became aware of a safety issue with a product. The PAT survey shows that **75%** of consumers took some form of action (e.g., returning the product), and **10%** complained to the manufacturer. The latter (complaining to the manufacturer) *should* bring any (genuine) safety issue to the attention of market surveillance authorities, whereas other actions (e.g., returning the product) *may* also do so. These two figures are used as multipliers in two sensitivity analyses.

5.74 Therefore, in two sensitivity analyses (sensitivity test 5 – see Section 6) the 46% figure is multiplied by 0.75 and 0.1, respectively. These multipliers represent the shares of consumers who took some form of action and who complained to the manufacturer when they became aware of a product safety issue.

Average home insurance payout from the Association of British Insurers

5.75 The average home insurance payout is used in the calculation of damage to property and insurance payout detriments (see paragraph 5.18). The average payout (from the Association of British Insurers) captures a wide range of domestic property claims, which do not necessarily reflect the types of damage that would be caused by unsafe or non-compliant products. Hence, the average payout serves only as a proxy (the best available proxy given data limitations).

Per unit cost of a recall based on Whirlpool's recall cost provision

5.76 Recall costs (for companies) per unit are estimated at 45.6% of the unit price based on Whirlpool's recall cost provision from their 2018-2020 recalls (see paragraph 8.26). This proportion is used to calculate the monetary cost of a recall. It is based on a single data point (Whirlpool's cost provision) for one type of product (washing machines). Thus, it does not accurately reflect the per unit cost of a recall for other types of products. Moreover, the per-unit costs of a mass recall may not be linear: large-scale recalls could either be costlier per unit (due to disproportionately higher coordination, reputational and legal costs) or cheaper per unit (if fixed costs are spread across more units). However, the level of detail provided by Whirlpool makes this the best available data, and it is used as an indicative proxy for modelling purposes. To improve representativeness,

further data on accounting provisions and recalled units across different product categories would need to be available.

Expected product lifetimes

5.77 As detailed in the Technical Appendix, expected product lifetime is another modelling input (used to 'spread' the detriments over time). Therefore, average product lifetimes are drawn from five sources.[42] For product categories where no data is available, the overall average (across all 122 data points) is used.

5.78 However, these average product lifetimes relate to products in general. The lifespans of unsafe and non-compliant products may be different (likely shorter) to those of products generally.

Data matching methods

5.79 Due to the wide range of datasets used in the modelling, it was necessary to match categories and variables across these datasets. While some datasets can be matched coherently, for others the matching is tenuous and requires subjective judgement. Thus, it should be noted that some of the approaches taken to match the data across various sources will affect the modelling results.

5.80 For example, as explained in paragraph 5.13, we combine the PSD probabilities of injury with monetary values from HSE's Cost to Britain methodology. PSD probabilities relate to different severities of injury, defined in the PRISM Guidelines. The HSE monetary values also relate to different severities of injury, and these severities are defined differently. Although the match between the PSD probabilities and HSE monetary values is, in our judgement, the most appropriate possibility, the definitions of severity of physical harm are not fully aligned.

5.81 A further example is the matching of product categories across various sources. The 21 product categories used in the model match to a greater or lesser degree with the different product categories in various data sources utilised in the model. The product matches used in the model are reported in the Technical Appendix (see Tables 12 to 17).

Double counting consideration

5.82 Double counting has been mitigated where possible. For example, in our model, businesses incur costs when providing sick pay to employees absent from work. While this is ultimately a transfer to consumers, to prevent double counting, these payments are not included on the consumer side.

5.83 However, there are two specific areas where double counting has not been fully avoided. First, costs associated with replacing products due to property damage and costs of replacing products due to injury are both included separately. Second, reputational damage resulting from property damage and reputational damage resulting from injury are also accounted for independently.

5.84 In both cases, it is possible that some consumers may experience both detriments simultaneously. However, as the proportion of consumers affected by both is unknown, this remains a caveat in the model.

[42] Department for Environment, Food and Rural Affairs (2011); Cox et al. (2013); Wieser et al. (2015); EC DG for Internal Policies (2016); and Cooper (2004).

Modelling scope

5.85 Finally, as noted earlier, the model does not quantify all types of consumers and business detriment. Due to data unavailability, several detriments had to be excluded from the modelling scope. These include environmental damage and emotional detriment from some sources.

5.86 Additionally, the highest form of consumer injury or harm has been excluded from the scope our analysis as discussed in Section 4. Therefore, the total monetary value of detriment is likely to be underestimated. **We insist on the use of 'minimum' detriment when analysing these conservative estimates.**

6 Findings of the model

6.1 This section presents the results from the model, estimating the total detriment caused by unsafe and non-compliant products. The full breakdown of results, including product-level variation and the relative contribution of each detriment type, is set out below. The estimates represent the central baseline scenario and reflect the assumptions and methodology outlined in Section 5.

Per product values of detriment

6.2 Table 3 and Table 4 present the per product values of detriment (broken down by consumer and business detriment) for unsafe and non-compliant products, respectively. Figures are reported in 2022 prices.

Table 3: Per product values of consumer and business detriment (Unsafe Products)

Product category	Consumer Detriment	Business Detriment	Total Detriment[43]
Chemicals	£66	£42	**£108**
Childcare products	£202	£143	**£345**
Clothing and accessories	£29	£24	**£52**
Construction products	£65	£33	**£97**
Cosmetics	£37	£14	**£51**
Electrical appliances	£145	£277	**£422**
Explosives	£70	£44	**£115**
Food imitation products	£66	£49	**£115**
Furniture and furnishings	£84	£153	**£237**
Gas Appliances	£66	£145	**£211**
Laser pointers	£21	£19	**£40**
Lighting and lighting chains	£68	£112	**£180**
Media, communication, IT equipment	£65	£226	**£292**
Medical products/devices	£67	£37	**£104**

[43] The total detriment may not appear to match the sum of the individual figures due to rounding. The total is calculated using unrounded values.

Product category	Consumer Detriment	Business Detriment	Total Detriment[43]
Personal protective equipment	£68	£83	**£151**
Pressure Equipment	£68	£75	**£142**
Recreational Craft	£24	£155	**£179**
Sporting Equipment and Articles	£42	£38	**£79**
Tools and machinery	£97	£127	**£224**
Toys	£40	£31	**£71**
Other products	£67	£33	**£99**

Notes: Estimates are in 2022 prices. Figures have been rounded to the nearest Pound.

Table 4: Per product value of consumer and business detriment (Non-compliant Products)

Product category	Consumer Detriment	Business Detriment	Total Detriment[44]
Chemicals	£47	£40	**£87**
Childcare products	£110	£137	**£247**
Clothing and accessories	£8	£22	**£30**
Construction Products	£46	£32	**£77**
Cosmetics	£19	£13	**£32**
Electrical appliances	£136	£276	**£412**
Explosives	£47	£43	**£89**
Food imitation products	£47	£48	**£94**
Furniture and furnishings	£65	£152	**£217**
Gas Appliances	£49	£144	**£193**
Laser pointers	£2	£18	**£20**
Lighting and lighting chains	£47	£111	**£158**

[44] The total detriment may not appear to match the sum of the individual figures due to rounding. The total is calculated using unrounded values.

Product category	Consumer Detriment	Business Detriment	Total Detriment[45]
Media, communication, IT equipment	£46	£225	**£271**
Medical products/devices	£47	£36	**£83**
Personal protective equipment	£49	£81	**£130**
Pressure Equipment	£48	£74	**£122**
Recreational Craft	£5	£153	**£158**
Sporting Equipment and Articles	£22	£37	**£59**
Tools and machinery	£78	£126	**£204**
Toys	£19	£29	**£48**
Other products	£48	£32	**£79**

Notes: Estimates are in 2022 prices. Figures have been rounded to the nearest Pound.

6.3 The tables above present estimated detriment by product category, distinguishing between consumer and business detriment for unsafe (Table 3) and non-compliant (Table 4) products. These results reflect the assumptions used in the central modelling scenario, including the method for estimating consumer injuries and the application of other detriment types (and their assumptions) as described in Section 5.

6.4 The model produces individual detriment estimates for 21 distinct product categories. These categories vary in terms of unit values, hazard and risk profiles, and the type of consumer likely to use them. For example, some products are more commonly used by children, while others may be more specialised items with a lower frequency of use. **This variation means that direct comparisons between categories – or the use of an overall average of detriment caused by an unsafe or non-compliant product would be misleading.** The characteristics of all the different product categories we are estimating detriment for are too disparate and heterogeneous to realistically combine.

6.5 Rather than focussing on a single summary figure, the model estimates are best interpreted by looking at the variation across product types, the key drivers of detriment and the relative contributions of consumer and business detriments. This approach enables the estimates to inform risked-based prioritisation and support regulatory decision-making, rather than produce a single headline figure.

6.6 In general, unsafe products have a higher estimated value of detriment than non-compliant products. The difference in the methodology between the two types of products is due to the probabilities of physical harm used in the analysis. This finding is

[45] The total detriment may not appear to match the sum of the individual figures due to rounding. The total is calculated using unrounded values.

due to non-compliant products (found in the PSD) being less likely to cause physical harm to consumers compared to unsafe products. In addition, products labelled 'non-compliant' in the PSD data appear be less likely to have accompanying risk assessments to extract probabilities from (paragraph 5.13). This results in non-compliant products not fully capturing the physical harm component of detriment. **For this reason, the discussion that follows focuses on unsafe products, where the impact on consumers and businesses is better evidenced and materially significant**.

6.7 Detriment values for unsafe products vary widely across the 21 product categories included in the model. Total detriment per product ranges from £422 for electrical appliances to £40 for laser pointers (Table 3). This range reflects differences in product risk, hazard type, unit prices, and the type of consumer and business impact. To support interpretation of these results, factsheets and worked examples of detriment calculations for key product categories are provided later in this section. These summarise how the detriment is calculated, what types of harm are driving the estimate, and which assumptions have the greatest influence.

6.8 The variation in detriment across product categories highlights the importance of understanding the drivers behind these estimates such as likelihood (and severity) of consumer harm or the scale of business losses. For example, detriment associated with Recreational Craft is mainly driven by business displacement costs whereas Childcare Products carry particular risk due to their exposure to very young children. Similarly, Electrical Appliances are associated with hazards such as fire, burns or electrical shock which can lead to consumer injury and significant property damage.

Consumer detriment breakdown

6.9 To investigate the drivers of the overall trends explained above, this section breaks down the consumer detriment into its constituent detriments.

6.10 Table 5 disaggregates the consumer detriment for unsafe products. The "other consumer detriments" column includes the cost of replacing the product and time loss detriments. Since these detriments are comparatively smaller in value, they have been grouped together for the purpose of this table.

Table 5: Per product consumer detriments (Unsafe products)

Product categories	Physical harm Severity Level 1, 2, and 3	Property damage Severity levels 1, 2 and 3	Other consumer detriments
Chemicals	£20	£39	£7
Childcare products	£93	£94	£15
Clothing and accessories	£21	£3	£4
Construction Products	£19	£39	£7
Cosmetics	£19	£4	£14
Electrical appliances	£9	£122	£13
Explosives	£24	£39	£7

Product categories	Physical harm Severity Level 1, 2, and 3	Property damage Severity levels 1, 2 and 3	Other consumer detriments
Food imitation products	£20	£39	£7
Furniture and furnishings	£19	£58	£6
Gas Appliances	£18	£35	£13
Laser pointers	£20	£0	£1
Lighting and lighting chains	£21	£39	£8
Media, communication, IT equipment	£20	£38	£7
Medical products/devices	£20	£39	£8
Personal protective equipment	£20	£39	£9
Pressure Equipment	£20	£39	£9
Recreational Craft	£19	£0	£4
Sporting Equipment and Articles	£20	£7	£15
Tools and machinery	£20	£63	£15
Toys	£22	£8	£10
Other products	£19	£39	£9

Notes: Estimates are in 2022 prices. Figures have been rounded to the nearest Pound. Individual figures may not sum exactly to the total due to rounding.

6.11 The breakdown of consumer detriment across product categories reveals relatively consistent values for physical harm, with most categories showing figures in the range of £18 to £24. This partly reflects the use of cross-product averages to estimate the likelihood of injury, following the removal of level 4 severity cases (those involving fatality or the most serious harm) from the analysis (paragraph 5.53). These level 4 cases, while present in the incident data, were found to skew the estimates due to underreporting of less severe incidents and the high costs associated with human life valuation.

6.12 This was a conscious modelling decision made to strike a balance between robustness and representativeness, and to avoid generating misleadingly high estimates based on severe cases. As a result, the consumer detriment figures presented in Table 5 should be interpreted as minimum values — representing the quantifiable harms that we can reasonably evidence based on available data. This conservative approach helps avoid overestimation, but it may also understate harm for categories such as Electrical Appliances, where incidents like fire or electrocution may not necessarily be notified in the PSD unless resulting in severe injury.

6.13 The consistency in physical harm values across many products is also due to limited data for some product categories being present in the PSD, which means probabilities of injury for most product categories are based on cross-product averages (childcare products, electrical appliances, lighting and toys use product-specific probabilities of injuries). In contrast, the Childcare Products category show relatively high detriment due to physical harm, which may reflect the greater risk for vulnerable users like children. Property damage has more of an impact (compared to injury) in most product categories like Electrical Appliances and Tools & Machinery. 'Other consumer detriments' including time loss and cost of product replacement tend to be modest across all product categories.

Business detriment breakdown

6.14 This section breaks down the overall business detriment into its constituent detriments. Table 6 disaggregates the business detriment for unsafe products. In this table, the "Other business detriments" column groups together business detriments like reputational damage and recall costs for businesses.

Table 6: Per product business detriments (Unsafe products)

Product categories	Displacement of compliant product sales	Business cost of absent worker	Insurance payout for damage to property	Other business detriments
Chemicals	£6	£1	£32	£2
Childcare products	£44	£6	£80	£13
Clothing and accessories	£18	£1	-	£4
Construction Products	-	£1	£31	-
Cosmetics	£10	£1	-	£3
Electrical appliances	£123	£1	£110	£44
Explosives	£8	£2	£32	£2
Food imitation products	£12	£1	£32	£3
Furniture and furnishings	£75	£1	£54	£22
Gas Appliances	£91	£1	£29	£24
Laser pointers	£15	£1	-	£3
Lighting and lighting chains	£60	£1	£32	£19
Media, communication, IT equipment	£150	£1	£33	£42
Medical products/devices	£3	£1	£32	£1
Personal protective equipment	£39	£1	£32	£11

Product categories	Displacement of compliant product sales	Business cost of absent worker	Insurance payout for damage to property	Other business detriments
Pressure Equipment	£32	£1	£32	£9
Recreational Craft	£126	£1	-	£28
Sporting Equipment and Articles	£28	£1	-	£9
Tools and machinery	£56	£1	£55	£16
Toys	£23	£1	-	£7
Other products	-	£1	£31	-

Notes: Estimates are in 2022 prices. Figures have been rounded to the nearest Pound. Individual figures may not sum exactly to the total due to rounding. *Where "-" is reported in the table, this means it was not possible to estimate the detriment for that product category (due to not being able to find sensible estimates of the average selling price).*

6.15 The three most significant contributors to business detriment are displacement of compliant product sales, cost to business of recalls and insurance payouts related to property damage.

6.16 For displacement of compliant product sales, the model uses a 1-for-1 displacement assumption (see paragraph 4.13). This assumes that each unsafe product on the market displaces a compliant one, representing a 100% probability of displacement across all product categories (excluding Construction Products and Other products – see paragraph 5.67). As a result, any variance in displacement values across product categories is due to the differences in the average selling price of the product. Higher values are observed in categories like Media and IT Equipment, Electrical Appliances, and Gas Appliances. Conversely, products such as Medical Products and Chemicals have relatively lower average unit prices and therefore generate lower displacement values.

6.17 Insurance payouts for property damage also represent a significant source of business detriment, typically ranging between £29 to £32 for most product categories. However, some categories including Electrical Appliances (£110), Childcare Products (£80) and Tools & Machinery (£55) stand out. These figures are based on modelled probabilities of high-severity (level 3) property damage, informed by the Public Attitudes Tracker (PAT) survey, which remains the best available evidence.

6.18 For Clothing and accessories, Cosmetics, Sporting Equipment and Articles, and Toys, the likelihood of level 3 property damage was estimated at 0%, resulting in a per-product value of zero. The per product value is estimated as zero because the PAT survey found no evidence of property damage for these products. As noted in paragraph 5.63, product-specific probabilities estimated using the PAT survey may not always capture the full hazard profile of each category. Similarly, the comparatively high value for Childcare Products may be overstated, as these products may not be typically associated with significant property damage. This highlights the modelling limitations in this area and suggest a need for further evidence-gathering in future iterations of the model.

Factsheets by product category

6.19 The following factsheets present key statistics, commentary, and information on the product categories included in the model. They are intended as a resource for users seeking detailed insights. To support a more focused analysis, a summary of the top 5 product categories, based on their estimated detriment, is provided below, highlighting the most significant areas covered in the subsequent pages.

Summary comments:

6.20 This section provides estimates of consumer and business detriment by product category. A complementary graph illustrates the breakdown of these detriments across unsafe products, offering a visual representation from a different perspective.

Key drivers:

6.21 This section includes definitions of the types of products included in each product category.

6.22 We also identify the primary consumer and business detriments with the greatest impact on our overall detriment estimates. These key drivers are also visualised in the accompanying graph.

Breakdown of detriments:

6.23 A visual representation of how the detriment figures are calculated is provided, highlighting the various components contributing to the overall detriment and their relative impact on the final calculation.

6.24 Please note that for clarity purposes, the charts display only the top three consumer and business detriments for each product category in these factsheets. All remaining detriment types have been grouped together to avoid overcomplicating the presentation.

Sensitivity tests:

6.25 This section presents the test that the product category is the most sensitive to.

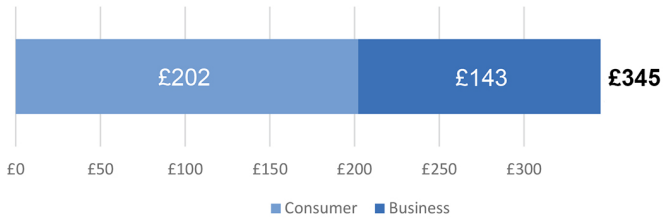
6.26 A more detailed breakdown of each sensitivity test and its individual impact is presented later in this section (see Summary Table 9).

Childcare products

Summary comments

The total detriment from unsafe childcare products is estimated at £345 per product.

Figure 2: Total Detriment (unsafe childcare products)

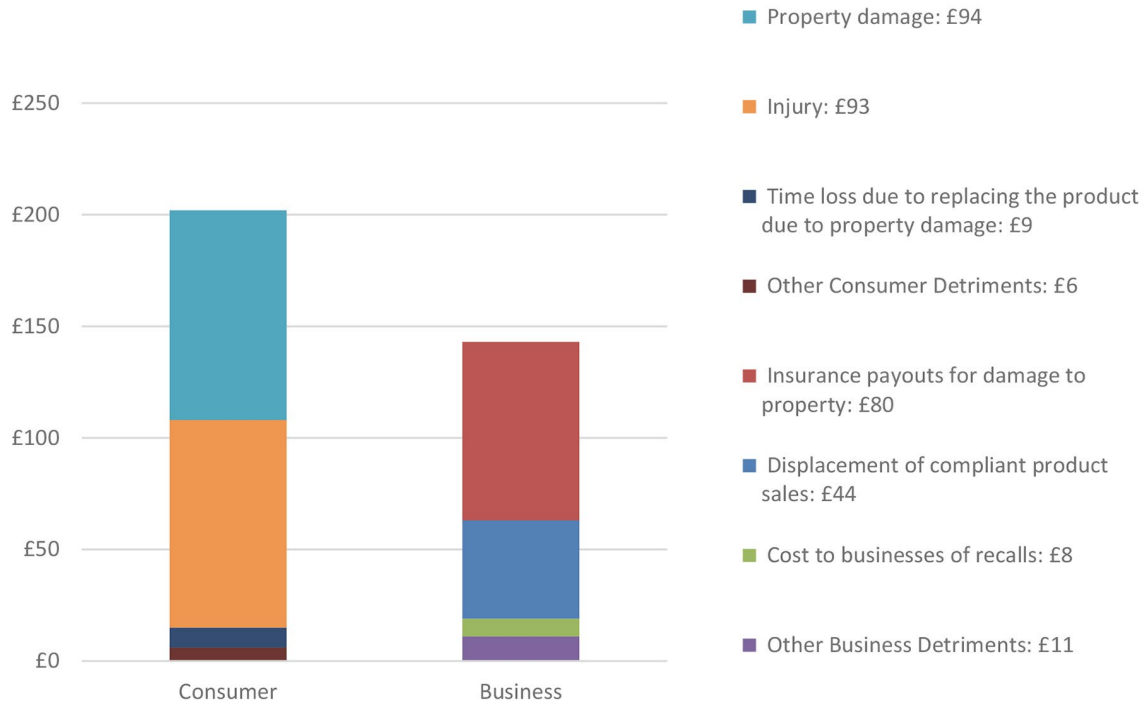


Key drivers

- Childcare products include items such as baby walkers, prams, soothers and highchairs.
- Much of the detriment from childcare products stems from property damage, injury and insurance payouts (for property damage).
- Detriment levels are likely to influenced by usage rates among households with young children.

Breakdown of detriments

Figure 3: Detriment Types (unsafe childcare products)



Sensitivity tests

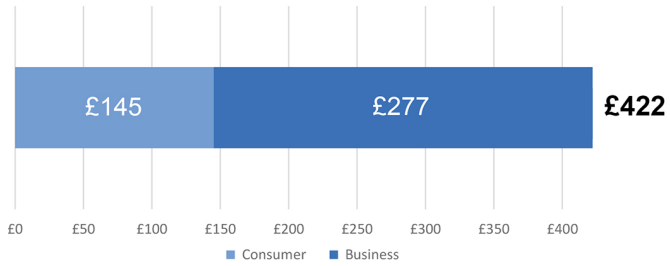
- **Rate of displacement for sales: the base assumption is a one-to-one replacement.**
- Changing this to 0.5 lowers the total detriment estimate from £345 to £323, a reduction of 6%.
- Changing this to 2 increases total detriment by 13% from £345 to £390.

Electrical appliances

Summary comments

The total detriment caused by unsafe electrical appliances is estimated at £422 per product.

Figure 4: Total Detriment (unsafe electrical appliances)

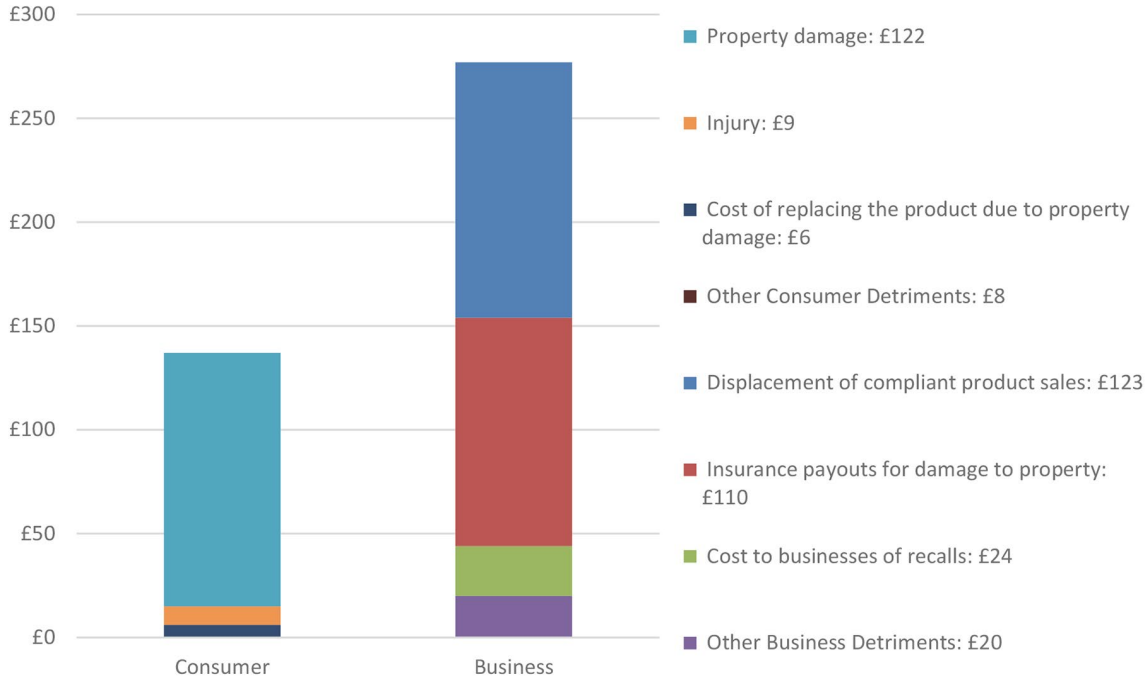


Key drivers

- Electrical appliances include heating and styling devices (pool immersion heaters, hair straighteners, hair dryers), lighting products, smart home accessories, chargers, and other items like vacuum cleaners.
- Much of the detriment from electrical appliances comes from property damage, insurance payouts and displacement of compliant product sales.

Breakdown of detriments

Figure 5: Detriment Types (unsafe electrical appliances)



Sensitivity tests

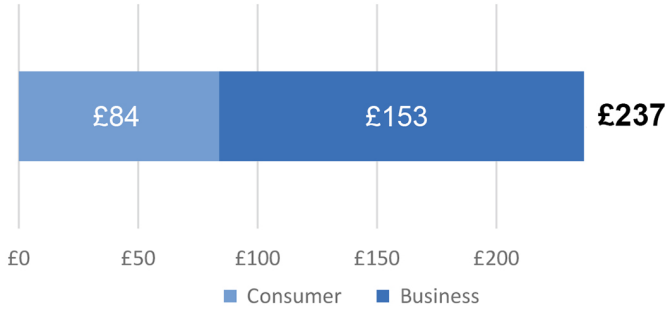
- **Rate of displacement for sales: the base assumption is a one-to-one replacement.**
- Changing this to 0.5 lowers the total detriment estimate to £361, a reduction of 15%.
- Changing this to 2 increases total detriment by 29% to £545.

Furniture and furnishings

Summary comments

The total detriment caused from unsafe furniture and furnishings in the UK market is estimated at £237 per item.

Figure 6: Total Detriment (unsafe furniture and furnishings)

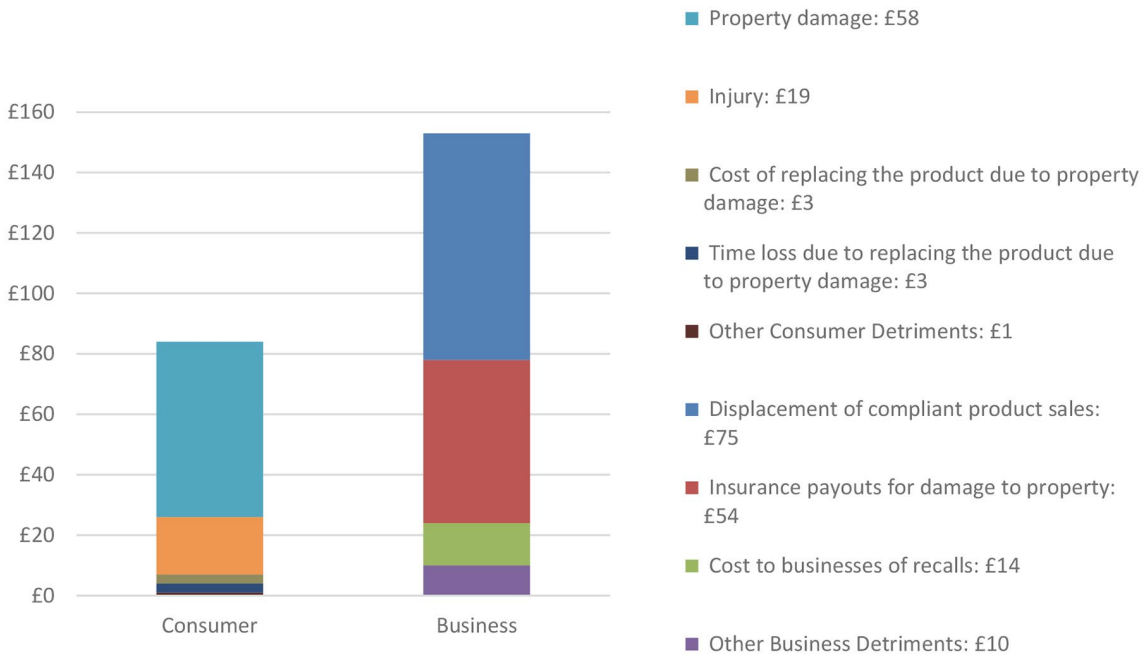


Key drivers

- Furniture and furnishings include items like sofas, beds, mattresses, chairs, stools, cushions, pillows, loungers, rattan sets, tables, camping furniture, and related parts and accessories.
- Much of the detriment from furniture and furnishings comes from property damage, displacement of compliant product sales and insurance payouts.

Breakdown of detriments

Figure 7: Detriment Types (unsafe furniture and furnishings)



Sensitivity tests

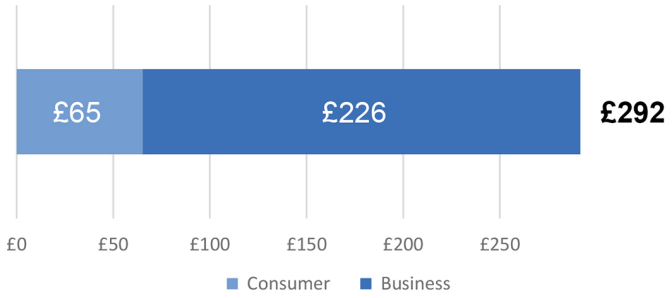
- **Rate of displacement for sales: the base assumption is a one-to-one replacement.**
- Changing this to 0.5 lowers the total detriment estimate to £199, a reduction of 16%.
- Changing this to 2 increases total detriment by 32% to £312

Media, communication and IT equipment

Summary comments

The total detriment caused by unsafe media, communication and IT equipment is estimated at £292 per item.

Figure 8: Total Detriment (unsafe media, communication, IT equipment)

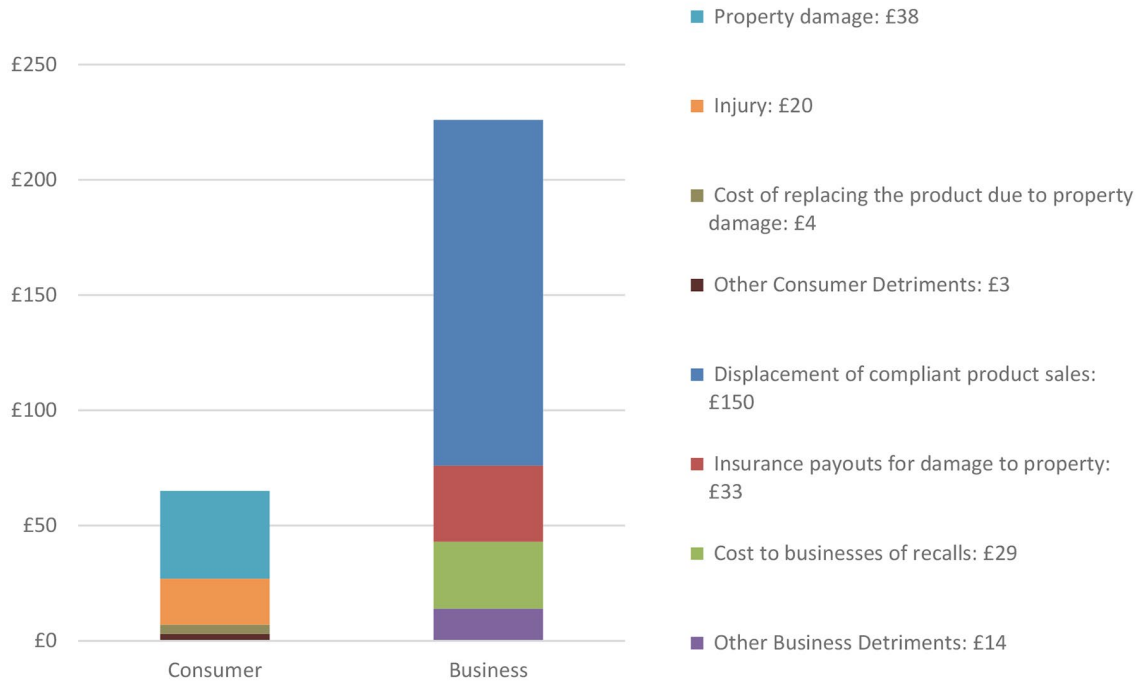


Key drivers

- Media, communication and IT equipment include media devices (TV boxes, media players), audio accessories (earphones, headphones, speakers, microphones), mobile phones and tablets.
- Business detriment is significantly greater than consumer detriment for this product category.
- More than half of the detriment from media, communication and IT equipment comes from displacement of compliant product sales.

Breakdown of detriments

Figure 9: Detriment Types (unsafe media, communication, IT equipment)



Sensitivity tests

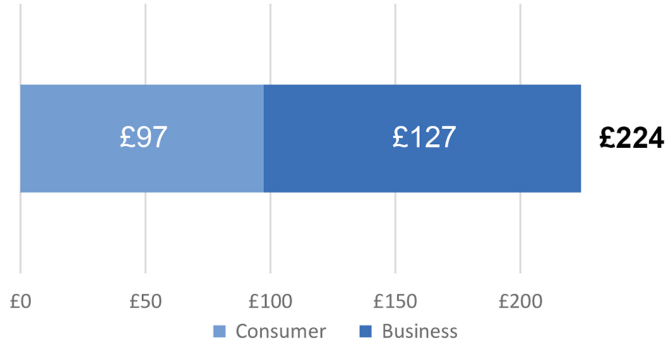
- **Rate of displacement for sales: the base assumption is a one-to-one replacement.**
- Changing this to 0.5 lowers the total detriment estimate to £217, a reduction of 26%.
- Changing this to 2 increases total detriment by 51% to £442.

Tools and machinery

Summary comments

The total detriment caused by unsafe tools and machinery in the UK market is estimated at £224 per item.

Figure 10: Total Detriment (unsafe tools & machinery)

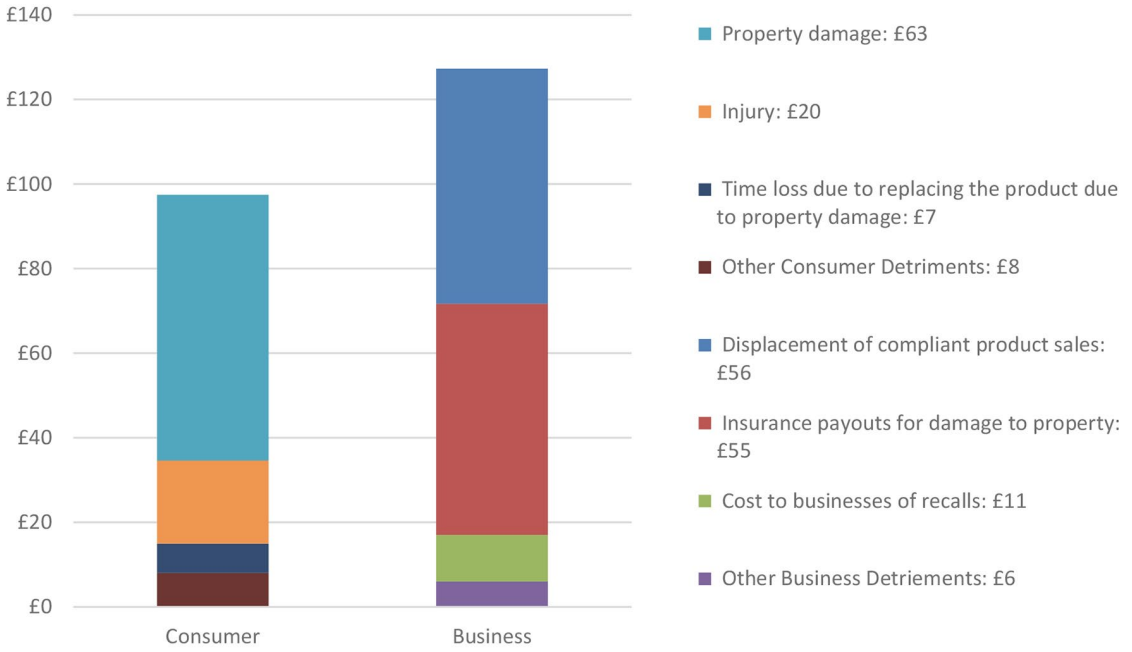


Key drivers

- Tools and machinery include items like electric scooters and hoverboards, electric bikes and tricycles, cordless drills and impact wrenches, cutting and grinding tools (circular saws, angle grinders, chainsaws), and specialist equipment such as welders, air compressors, and diamond core drills.
- Much of the detriment from tools and machinery comes from displacements of compliant product sales, property damage and insurance payouts.

Breakdown of detriments

Figure 11: Detriment Types (unsafe tools & machinery)



Sensitivity tests

- **Rate of displacement for sales: the base assumption is a one-to-one replacement.**
- Changing this to 0.5 lowers the total detriment estimate to £196, a reduction of 12%.
- Changing this to 2 increases total detriment by 25% to £280.

Worked examples of model calculations

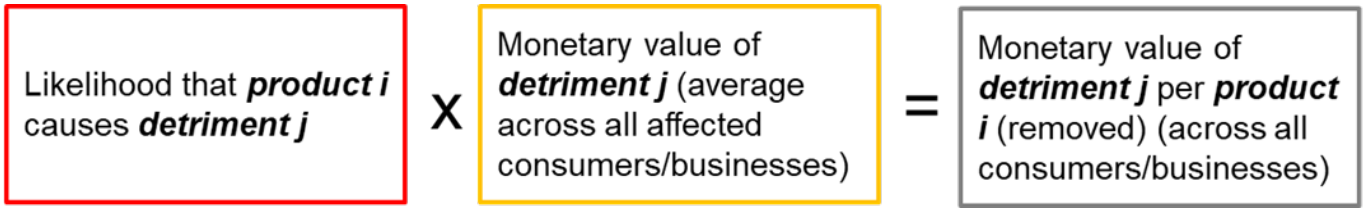
6.27 To support a deeper understanding of how per-product detriment values were calculated, this sub-section walks through selected worked examples. The examples provide transparency on the logic behind the estimates, using key inputs such as likelihoods and unit costs across selected detriments.

6.28 While the main report presents summary detriment values by product category, these worked examples reflect the step-by-step approach applied in the model for consumer and business detriment estimates.

General approach

6.29 We can generalise the calculation approach by expressing the calculation below for product type *'i'* and detriment *'j'*. The total per-product detriment is then the sum of these values across all types of consumer or business detriments included in the model. Here product *'i'* may stand for a specific product, for example, unsafe toys and detriment *'j'* may stand for a specific detriment, for example, an injury of a specific severity level. The generalised approach is shown in the equation in Figure 1:

Figure 1 Overarching calculation approach



Example: Unsafe toys (consumer detriment)

6.30 This worked example shows step-by-step how the model estimates consumer detriment for unsafe toys. It illustrates how the general approach (Figure 1) is practically applied by combining the likelihood of detriment with the monetary valuations to produce an overall estimate of detriment per unsafe toy. The steps taken are described in the paragraphs below.

6.31 **Step 1: identify detriment types**. For unsafe toys, the potential consumer detriments include physical harm to consumers; damage to property; cost of replacing the product due to (i) physical harm and (ii) damage to property; time loss due to (i) physical harm and (ii) damage to property; and time loss due to product recalls.

6.32 **Step 2: apply likelihoods and monetary values**. Each consumer detriment we are trying to estimate is assigned a likelihood (the probability of that consumer detriments occurring) and a monetary value (the cost associated with that detriment).

6.33 **Step 3: calculate expected detriment values**. For each consumer detriment type, we multiply the likelihood by the monetary value. Table 7 below shows these calculations for each consumer detriment type. The table below sets out each component of the calculation, showing how the total expected detriment per unsafe product is derived by multiplying the probability and monetary value of each detriment type and across severities, where relevant to the consumer detriment.

Table 7: Calculation of consumer detriment for unsafe toys (Unsafe products)

Detriment type	Likelihood Of Detriment	Monetary cost of detriment	Calculation	Undiscounted result	Discounted result
Physical Harm (level 1)	0.15%	£414.25	0.15% X £414.25	£0.63	£0.60
Physical Harm (level 2)	0.09%	£8,620.88	0.09% X £8620	£7.60	£7.23
Physical Harm (level 3)	0.04%	£33,811.78	0.04% X £33,811.78	£14.69	£13.97
Damage to property (level 1)	17.08%	£49.29	17.08% X £49.29	£8.42	£8.01
Damage to property (level 2)	*Zero*	£238.22	0.0% X £238.22	*Zero*	*Zero*
Damage to property (level 3)	*Zero*	£2,216.75	0.0% X £2216.75	*Zero*	*Zero*
Cost of replacing the product due to property damage (level 1)	8.37%	£22.64	8.37% X £22.64	£1.89	£1.80
Cost of replacing the product due to property damage (level 2)	*Zero*	£22.64	0.0% X £22.64	*Zero*	*Zero*
Cost of replacing the product due to property damage (level 3)	*Zero*	£22.64	0.0% X £22.64	*Zero*	*Zero*
Cost of replacing the product due to injury (level 1)	0.07%	£22.64	0.07% X £22.64	£0.02	£0.02
Cost of replacing the product due to injury (level 2)	0.04%	£22.64	0.04% X £22.64	£0.01	£0.01
Cost of replacing the product due to injury (level 3)	0.02%	£22.64	0.02% X £22.64	£0.00*	£0.00*
Time loss due to product recall	2.44%	£79.03	2.44% X £79.03	£1.93	£1.86
Time loss due to replacing the product due to property damage (level 1)	8.37%	£79.03	8.37% X £79.03	£6.61	£6.29
Time loss due to replacing the product due to property damage (level 2)	*Zero*	£79.03	0.00% X £79.03	*Zero*	*Zero*
Time loss due to replacing the product due to property damage (level 3)	*Zero*	£79.03	0.00% X£79.03	*Zero*	*Zero*
Time loss due to replacing the product due to injury (level 1)	0.07%	£79.03	0.07% X £79.03	£0.06	£0.06
Time loss due to replacing the product due to injury (level 2)	0.04%	£79.03	0.04% X £79.03	£0.03	£0.03
Time loss due to replacing the product due to injury (level 3)	0.02%	£79.03	0.02% X £79.03	£0.02	£0.02
Total	-	-	-	**£41.91**	**£39.89**

Notes: Estimates are in 2022 prices. Probabilities are rounded to two decimal places for clarity (zero denotes an actual 0; asterisk denotes a non-zero rounded value). See paragraph 6.34 for methodological details on unrounded probabilities, discounting, and product lifetime assumptions.

6.34 The undiscounted values in Table 7 are calculated using the full, unrounded probability values from the model,therefore, the displayed calculations may not exactly reproduce the undiscounted results shown. The 'Undiscounted Result' column represents the expected detriment before discounting is applied. These values are derived by multiplying the full unrounded likelihoods of detriment by the corresponding monetary cost of each outcome. The 'Discounted Result' column then adjusts these figures to reflect their present value (PV), in line with the HM Treasury Green Book discount rate of 3.5%. This adjustment accounts for the fact that detriment is distributed uniformly over the expected lifetime of the product. For example, in the case of toys, detriment is assumed to occur over a three-year period (see Table 11); each year's expected detriment is therefore discounted to its present value before being aggregated.

6.35 **Step 4: calculate total consumer detriment for unsafe toys**. Table 7 provides an estimated value for each consumer detriment type. By summing these discounted estimates, we obtain the total consumer detriment value for unsafe toys (approximately £40). Each detriment type is modelled by combining the probability that an unsafe product causes that detriment with the corresponding monetary valuation. This aggregation represents the total present value of consumer detriment per unsafe product.

6.36 A parallel worked example showing how the model estimates business detriment for unsafe toys is presented in Table 8. The same methodological caveats described in paragraph 6.34 apply, specifically regarding the use of unrounded probabilities, undiscounted and discounted results, and the application of the discount rate over the product's lifetime. This example follows the same overarching calculation framework (Figure 1) as for consumer detriment, with the main distinction being that the detriment types modelled here relate to business detriment rather than consumer detriment.

Table 8: Calculation of business detriment for unsafe toys (Unsafe products)

Detriment type	Likelihood Of Detriment	Monetary cost of detriment	Calculation	Undiscounted result	Discounted result
Displacement of compliant product sales	100%	£22.64	100% X £22.64	£22.64	£22.64
Business cost of absent worker (Level 1)	0.074%	£67.02	0.074% X £67.02	£0.05	£0.05
Business cost of absent worker (Level 2)	0.043%	£1,096.61	0.043% X £1,096.61	£0.47	£0.45
Business cost of absent worker (Level 3)	0.021%	£4,386.45	0.021% X £4386.45	£0.93	£0.89
Reputational costs of injury (Level 1)	0.078%	£22.64	0.078% X £22.64	£0.02	£0.02
Reputational costs of injury (Level 2)	0.045%	£22.64	0.045% X £22.64	£0.01	£0.01
Reputational costs of injury (Level 3)	0.022%	£22.64	0.022% X £22.64	£0.01	£0.00*
Reputational costs of damage to property (Level 1)	8.711%	£22.64	8.711% X £22.64	£1.97	£1.88
Reputational costs of damage to property (Level 2)	Zero	£22.64	0.00% X £ 22.64	*Zero*	*Zero*
Reputational costs of damage to property (Level 3)	Zero	£22.64	0.00% X £22.64	*Zero*	*Zero*

Detriment type	Likelihood Of Detriment	Monetary cost of detriment	Calculation	Undiscounted result	Discounted result
Insurance Payout for damage to property (Level 3)	Zero	£2,483.25	0.00% X £2483.25	*Zero*	*Zero*
Cost to businesses of recalls	46%	£10.32	46% X £10.32	£4.75	£4.59
Reputational costs of recall	1.244%	£22.64	1.244% X £22.64	£0.28	£0.25
Total	-	-	-	**£31.12**	**£30.77**

Notes: Estimates are in 2022 prices. Probabilities are rounded to two decimal places for clarity (zero denotes an actual 0; asterisk denotes a non-zero rounded value). See paragraph 6.34 for methodological details on unrounded probabilities, discounting, and product lifetime assumptions.

6.37 This worked example shows step-by-step how the model estimates business detriment for unsafe toys. **Step 1: identify detriment types**. For unsafe toys, the potential business detriments include displacement of compliant product sales; business cost of absent worker; reputational costs of (i) injury, (ii) damage to property and (iii) recall; insurance payout for damage to property and cost to businesses of recalls.

6.38 **Step 2: apply likelihoods and monetary values**. Each business detriment is assigned a likelihood (the probability of that business detriments occurring) and a monetary value (the cost associated with that detriment).

6.39 **Step 3: calculate expected detriment values.** For each business detriment type, we multiply the likelihood by the monetary value, giving an undiscounted estimate of detriment. Table 8 sets out these components and shows how the total expected detriment per unsafe product is derived by multiplying the probability and monetary value of each detriment type across severity levels, where relevant. **As with the consumer detriment example in Table 7, the 'Discounted Result' column then adjusts the undiscounted values to reflect their present value. This discounting accounts for detriment occurring uniformly over the expected lifetime of the product** (see paragraph 6.34).

6.40 **Step 4: calculate total business detriment and combine with consumer detriment.** By summing the discounted business detriment values in Table 8, we obtain a total business detriment value of approximately £31 per unsafe toy. When combined with the consumer detriment estimate in Table 7 (approximately £40), this gives a total detriment estimate of around **£71** per unsafe toy (Table 3). This estimate follows the calculation method outlined in Figure 1, aggregating across all detriment types by multiplying the likelihood that unsafe toys cause a given detriment by the associated monetary cost and applying discounting to reflect present values.

Sensitivity analysis

6.41 Sensitivity analysis was undertaken to assess how changes in key input assumptions influence the estimated value of detriment. The objective of this analysis is to test the robustness of the model's estimates and identify which assumptions or inputs have the greatest influence on the results presented in Section 6. This supports better risk management and more informed decision-making. The Technical Appendix provides some additional detail to support the sensitivity analysis presented below.

Sensitivity Test 1: Probabilities of physical harm

6.42 The first two tests relate to how the PSD is used to estimate the probabilities of physical harm used in the model.

6.43 Different approaches can be taken to estimate the probabilities of harm from the PSD. For each unsafe or non-compliant product reported in the PSD, a value is given for the probability that it will cause physical harm *for just one severity level*. Under our central modelling scenario, we assume that if a product causes physical harm of a given severity, it also has the same probability of causing harm at lower severity levels. The rationale for this is that if a product can cause a severe injury, it may also be capable of causing a less severe injury. For example, if the PSD records a probability of injury at severity level 3, we assume that the same product has an equivalent probability of causing injuries at levels 1 and 2. That said, in reality, these probabilities are not available for every product category at every severity level – note that product category-specific probabilities are only used if at least 10 datapoints are available for the relevant product category. In this sensitivity test, it is assumed the probabilities of physical harm for the severity levels not identified in the PSD are zero.

6.44 Using this alternative approach, the estimated average probabilities of physical harm of severity levels 1, 2 and 3 are lower than those in the central scenario. Therefore, overall, the alternative scenario results in lower values of physical harm per product relative to the central analysis. Across product categories, this leads to an average reduction of 3.55% in total detriment estimates (Table 9). On average, **consumer detriment** across all unsafe products falls by approximately 6.8% under this scenario compared to the central analysis. The contribution of injury as a proportion to total detriment also declines, by an average of 2.4 percentage points.

6.45 Therefore, this alternative approach results in a modest overall downward shift in detriment estimates (Table 9). The central modelling assumption states that if a product causes higher severity harm it is likely to cause lower-severity harm is deemed more plausible from both a behavioural and safety perspective. Assuming a zero probability for less severe injuries, because they are not explicitly recorded in the PSD, risks underestimating the broader spectrum of harm. Therefore, while this sensitivity test offers a useful benchmark, we consider the central scenario to be more robust and it provides a more realistic approach for estimating minimum consumer detriment.

Sensitivity Test 2: Probabilities of physical harm

6.46 This test assesses how sensitive the model's estimates of consumer detriment are to small changes in the estimated probabilities of physical harm, which are derived from the Product Safety Database (PSD). In the central scenario, we apply cross-product average probabilities for most product categories[46] (injury severity levels 1–3). These cross-product average probabilities of injury are relatively small in magnitude such as 0.214% for severity level 1, 0.137% for level 2, and 0.048% for level 3. Given their small base values, even modest changes to these inputs could have non-negligible effects on the detriment estimates.

6.47 To explore this, we run two variants:

- A lower bound scenario, applying a 10% decrease to each of the severity-level probabilities: 0.193%, 0.124%, and 0.043% respectively.
- An upper bound scenario, applying a 10% increase: 0.236%, 0.151%, and 0.053% respectively.

[46] Product category-specific probabilities are only used if at least 10 datapoints (i.e., probabilities) are available in the PSD for the relevant product category in total and there is at least one estimate for the product category and severity pairing. Childcare products, electrical appliances, explosives (injury severity level 2), lighting & lighting chains and Toys use product-specific probabilities of injury.

6.48 A ±10% variation was selected as a sensitivity marker because it represents a moderate, yet plausible, proportional change in the underlying probabilities. This approach is widely used in scenario analysis to assess the robustness of results to parameter uncertainty without introducing unrealistic extremes. Most product categories in the model use cross-product averages for these probabilities, therefore, the effect of these changes is broadly similar across categories. In both bounds, the change in overall consumer detriment is relatively modest but not negligible. The average change in total consumer detriment across all unsafe product categories ranges from approximately **-3.96% in the Lower Bound** to **+3.96% in the Upper Bound**.

6.49 Despite similar relative impacts across most categories, a few product categories stand out. In the lower bound test, categories such as Laser Pointers, Recreational Craft and Clothing & Accessories show detriment reductions slightly lower than the average reduction. Similarly, in the Upper Bound test, the same categories show slightly higher than average increases in consumer detriment. These shifts appear to reflect interaction between other model inputs (such as unit prices) and the applied probability multipliers, rather than being driven by their specific risk profiles. Given these categories use cross-product averages, the larger changes observed are likely due to random alignment with other influential model parameters rather than a structural modelling issue.

6.50 Overall, this sensitivity test reinforces that the model is modestly sensitive to changes in the injury probabilities input. However, the structure of the model, particularly the reliance on averaged probabilities, dampens product-specific variation. As such, the changes observed are generally consistent across product categories, rather than indicative of significant risk in any single category.

Sensitivity Test 3: Rate of displacement of sales

6.51 This test examines the 1-for-1 (displacement) assumption made for the displacement of compliant product sales business detriment. Based on theoretical economic arguments that imply the displacement rate could be more complex than the 1-for-1 assumption implies, we apply two alternative assumptions for the rate of displacement:

- Lower bound: 0.5 (half the rate in the central scenario)
- Upper bound: 2.0 (double the rate in the central scenario).

The purpose is to test to what extent adjusting this assumption impacts the results. Please refer to the Technical Appendix for a full explanation.

6.52 Adjusting the displacement rate has a substantial impact on the total detriment across the product categories from -35.3% under the lower bound scenario to +70.5% in the upper bound scenario. This variation is not uniform, categories with higher average unit prices such as recreational craft, gas appliances and media, communication and IT equipment show the largest movements in total detriment. This is because the product displacement assumption directly scales the ‘lost revenue due to displacement of compliant products’ business detriment, which is price driven.

6.53 The results of this test are in line with expectations, as the business detriment due to displacement of compliant product sales is inherently tied to the average selling price of products. Categories with higher average unit prices show the greatest variation in results. This is because changes in the displacement assumption translate into near proportionate shifts in the said business detriment. For this reason, the model uses a comprehensive pricing approach drawing on three separate data sources (Statista, ONS, and a targeted web sweep) to estimate average selling prices (paragraph 5.29). In effect, the sensitivity of this test is amplified for high-value products, making pricing a critical determinant of model responsiveness. While the displacement assumption has a

strong impact on specific product categories, it is important to interpret these effects through the lens of product pricing and its role in the model structure.

Sensitivity Test 4: Alternative assumption about the repurchase rate

6.54 This test relates to the assumption made for the cost of replacing a product and reputational damage detriments. Using information on the repurchase rate from the survey results of BIS (2014), we re-estimate the repurchase rate for consumers that have experienced physical harm, property damage, or a recall due to a non-essential product. This is implemented through a multiplier that adjusts the probability of these detriments occurring. The multiplier is based on BIS survey data, which estimates that around 26% of consumers would not repurchase a discretionary product after experiencing harm. This multiplier corresponds to the share of non-essential products that would not be repurchased due to the consumer experiencing harm. Please refer to the Technical Appendix for a detailed breakdown of how the multiplier is derived.

6.55 Overall, this test shows that adjusting the repurchase assumption has a net upward effect on total detriment, though the magnitude remains modest for most categories (generally below +3%, with three categories such as construction products, toys, and sporting equipment above this range). On average, the reduction in business detriment (–1.96%) from lower reputational damage is more than offset by the increase in consumer detriment (+6.63%) from higher replacement costs. This imbalance means that, on average, total detriment rises.

Sensitivity Test 5: Distribution of detriment over time

6.56 This test relates to how detriments are distributed over time (see paragraphs 8.28 to 8.30 for more information). In the central scenario, we assume that an unsafe or non-compliant product is equally likely to cause detriments in each year of its lifetime (i.e. detriments are distributed uniformly across the product's lifetime). In the alternative scenarios for this sensitivity test, the detriments are assumed to be either linearly increasing or linearly decreasing over time. The former assumption means that the likelihood is 0% in the period when a product is removed and rises linearly until the end of the product's lifetime. The latter means that the likelihood is at its maximum in the period when a product is removed and decreases linearly until it is 0% at the end of that product's lifetime.

6.57 Using the linear increase distribution reduces the total value of detriment relative to the central scenario. This makes sense because detriments are more likely to occur in future periods and are so more heavily discounted (using the Green Book discount rate of 3.5%) when calculating the present value. Likewise, applying the linear decrease distribution raises the total value of detriment (relative to the central scenario). Detriments are more likely to occur in earlier periods so are discounted less.

6.58 The changes in the total value of detriment under these scenarios are relatively small. Relative to the central scenario, the percentage difference across the product categories ranges from -4.22% to 4.07%.

Sensitivity Test 6: Likelihood of a recall

6.59 This test relates to the likelihood of a recall. In the central analysis, 46% is used since the US CPSC estimates that this is the proportion of cases, they receive that lead to a recall. However, not all unsafe and non-compliant products will come to the attention of market surveillance authorities (like the OPSS or CPSC).

6.60 Using data from the PAT, two figures are used as multipliers in two sensitivity analyses to reduce the estimated likelihood that a product is recalled. Specifically, the 46% figure (in the previous paragraph) is multiplied by 0.75 in one sensitivity test (equalling 34.5%),

and by 0.1 in another sensitivity test (equalling 4.6%). Please see the Technical Appendix (paragraph 8.48) for more information on the rationale for using these multipliers.

6.61 These sensitivity tests result in two effects. For most product categories, the **per product values of business detriment decrease.** This is because businesses incur recall costs, which on average are reduced if a recall is less likely. On the other hand, **the per product values of consumer injury and property damage increase slightly for all product categories**. This is because recalls remove the risk of consumer detriments (e.g. physical harm and property damage).

6.62 However, the size of these two effects is small. In the first sensitivity test (with a recall likelihood of 34.5%), the maximum reduction in the value of business detriment across the product categories is approximately £8 (3.4%). For consumer detriments, the largest increase in the per product value of consumer injury and property damage is approximately £0.40 (2.1%) and £1.00 (0.8%) respectively.

6.63 In the second sensitivity test (with a recall likelihood of 4.6%) the effects are more pronounced for business detriment. Business detriments fall by around 8% on average across the product categories. Consumer injury and property damage increase by an average of 2.1% and 1.9% respectively.

6.64 The impact on total detriment relative to the central analysis is modest: between -4.91% and -0.21% for the first sensitivity test, and between -17.3% and -0.74% for the second sensitivity test.

Summary

6.65 To support interpretation of the sensitivity analysis, Table 9 summarises the impact of each test on total detriment, relative to the central scenario. Total detriment is used here as the common metric because it captures the overall effect of changes to consumer and business detriments, providing a consistent basis for comparison across tests.

Table 9: Summary of sensitivity test impact on total detriment

Sensitivity Test	Description of Input Change	Average Impact on Total Detriment (relative to central scenario)
Test 1	Assume zero probability for unidentified injury severities	-3.55 %
Test 2 (lower bound)	Reduce injury probabilities by 10%	-2.08 %
Test 2 (upper bound)	Increase injury probabilities by 10%	+2.08%
Test 3 (Lower Bound)	Displacement rate = 0.5	-12.59%
Test 3 (Upper Bound)	Displacement rate = 2.0	+25.18%
Test 4	Adjust repurchase rate using BIS multiplier	+2.08%
Test 5 (linear increase)	Linear increase until the end of the product's lifetime	+3.05%
Test 5 (linear decrease)	Linear decease until the end of the product's lifetime	+2.80%

Sensitivity Test	Description of Input Change	Average Impact on Total Detriment (relative to central scenario)
Test 6 (Recall rate 0.75×)	Recall likelihood = 34.5%	-1.73%
Test 6 (Recall rate 0.1×)	Recall likelihood = 4.6%	-6.08%

7 Forward look

7.1 This report represents OPSS's first comprehensive attempt to develop an evidence-based approach for estimating consumer and business detriment caused by unsafe or non-compliant products on the UK market. This work is important in strengthening the analytical foundations that support regulatory decision-making, demonstrate the value of enforcement, and help prioritise activity where it delivers the greatest benefits.

7.2 The model presented in this report builds on the methodological foundations established in earlier commissioned research and reflects the best available evidence at the time of writing. As outlined in the report however, there remain material data gaps, particularly around injury severity and the use of survey data.

7.3 The detriment estimates presented in this report are intentionally conservative. Some forms of detriment, including the most severe injuries, environmental and emotional detriment could not be quantified in this study. As OPSS continues to strengthen its evidence gathering, opportunities will arise to broaden the scope of the detriment model and improve key model inputs. Future development of this work is expected to focus on improving the evidence base, refining modelling assumptions where new evidence becomes available and ensuring the approach remains transparent and analytically robust.

7.4 This report therefore establishes a strong foundation for estimating detriment caused by unsafe or non-compliant products on the UK market. Continued refinement and enhancement will enable OPSS to deepen its understanding of where these products impose the greatest harm on consumers, businesses and the wider economy.

8 Technical Appendix

8.1 This technical appendix provides additional information on the methodology to calculate the consumer and business detriment caused by unsafe and non-compliant products in the UK supply chain. This Appendix also includes formal definitions, technical clarifications and acronyms used in the main report. It supplements the main report by setting out the underlying assumptions, data sources, modelling choices and sensitivity tests in full, ensuring transparency around how the estimates have been derived.

Product categories modelled

8.2 The model uses a wide range of different datasets and sources, all of which use different product groupings and categories. Hence, a significant challenge was to find a suitable set of product categories for the modelling, which allows product categories to be mapped across datasets.

8.3 The analysis models the per product values of detriment for 21 high-level product categories. These categories are developed from the product categories used in the Border Returns (BR) data (see Table 17), which contains information on unsafe and non-compliant products removed at the border. Classification of individual cases within the BR dataset is done by Trading Standards officers based on available evidence and their best subjective judgement. Therefore, while most categories are quite self-explanatory as to what they contain, others are broader and contain many different types of products.

8.4 These 21 high-level categories are:

- Chemicals (including, hand sanitisers and air fresheners);
- Childcare products (including, baby walkers, prams, soothers, high chairs);
- Clothing and accessories;
- Construction products;
- Cosmetics;
- Electrical appliances;
- Explosives (including, pyrotechnics and fireworks);
- Food imitation products (i.e. any product that looks like food);
- Furniture and furnishings;
- Gas appliances (including gas water heaters);
- Laser pointers (including, laser pens and laser alignment tools);
- Lighting and lighting chains (including lightbulbs and Christmas lights);
- Media, communication, IT equipment;
- Medical products/devices (e.g. contact lenses, plasters, dental devices, medical diagnostic devices, condoms);
- Personal protective equipment (including, face masks, sunglasses and high visibility clothing);
- Pressure equipment (such as pressure cookers);
- Recreational craft (i.e. boats between 2.5 and 24m, personal watercraft and components);
- Sporting equipment and articles (e.g. bicycles, climbing equipment);
- Tools and machinery;
- Toys; and,

- Other products (NB, In the BR data, products in this category included USB cables, handbags and candles. This catch-all category predominantly relies on using cross-product averages (see paragraph 8.9 below) to measure the size of detriment.)

8.5 There are 39 (more granular) product categories within the BR data. These relate to EU Directives and in some cases also link to the applicable test standard that accompany the legislation. For example, for toys there are additional requirements that manufacturers must meet regarding the labelling and construction of toys for children under 3 years. Hence, the Border Returns data contains a category for *Toys for Children Under 3 Years* as well as *Other Toys for Children*. In the modelling, we combine these two into a single Toys category.

8.6 Given that several datasets and sources, which all use different product groupings, are used in the model, using the 21 broader categories was identified as the most practical and feasible solution to the challenge mentioned in paragraph 8.2 of mapping product categories across disparate datasets.

8.7 Furthermore, this methodology/model is intended to be applicable to a range of market surveillance activities. Per product values for the 21 broader product categories can also support additional intervention types.

8.8 Table 17 in this Appendix presents the complete mapping between the BR data's 39 categories and the 21 model categories. The mapping is subjective since it was not always obvious how to map some BR categories to the model categories.

8.9 Tables 12-16 present all the matches between other datasets' categories and the model categories. While we make every effort to model the detriments using values specific to each product category, this is not always possible. Therefore, we may apply general values that are not specific to product categories, where data gaps exist. Throughout, we refer to these values as cross-product averages**.**

Consumer detriment calculations

Physical harms (injuries, illnesses and fatalities)

8.10 The model uses the cost estimates from the Health and Safety Executive (HSE) Cost to Britain methodology (adjusted to 2022 prices[47]). These are costs per incident of harm, relevant to workplace injuries. The estimates used are the "human" costs defined as *"representing a monetary estimate of the loss of quality of life, and loss of life in the case of fatal injuries".* Despite being relevant to workplace injuries, these human costs are relevant for injuries occurring in other settings (e.g., at home), since the loss of quality of life from an injury would not vary depending on where it is sustained. (NB, "human" costs do **not** include sick pay payments to injured consumers. Sick pay is instead counted as a cost to businesses in the model. Loss of income for injured individuals is also excluded since there was not sufficient data in the HSE methodology to estimate this.) The HSE costs are matched with severity (levels 1-3) that are used in the model (from the PRISM Guidelines) as shown below in Table 10.

[47] Costs are inflated to 2022 prices using the ONS CPI Index.

Table 10: Physical harm definitions by severity level based on PRISM Guidelines matched with the HSE appraisal values of human cost used in the modelling

Severity level	PRISM definition	HSE definition	HSE value in 2022 prices
1	Injury or consequence that after basic treatment (first aid, normally not by a doctor) does not substantially hamper functioning or cause excessive pain; usually the consequences are completely reversible	Up to 6 days off work	£414
2	Injury or consequence for which a visit to A&E may be necessary, but in general, hospitalisation is not required. Functioning may be affected for a limited period, not more than about 6 months, and recovery is more or less complete	Average non-fatal injury	£8,621
3	Injury or consequence that normally requires hospitalisation and will affect functioning for more than 6 months or lead to a permanent loss of function	7 or more days off work	£33,812
4	Injury or consequence that is or could be fatal, including brain death; consequences that affect reproduction or offspring; severe loss of limbs and/or function, leading to more than approximately 10% of disability	Fatality	£1,555,118

Note: HSE values have been inflated to 2022 prices using the ONS CPI Index.

Source: PRISM guidelines[48] and HSE Appraisal Values, Table 1: Costs to Society per case – average appraisal value estimates. (HSE: Economics of Health and safety - Appraisal values or 'unit costs')

8.11 The following section details the methodology for the calculation of the consumer detriments. The model multiplies the above monetary costs by the estimated probabilities that unsafe and non-compliant products cause physical harm to consumers at severity levels 1 to 3. Note that Level 4 related harm is excluded from the analysis (see paragraph 5.53). These probabilities are estimated based on the product-specific risk assessments submitted to the Product Safety Database (PSD).

Cost of replacing products due to physical harm to consumers

8.12 An estimate of the average selling price of a single product for each product category is used as the cost of replacing the product (i.e., the monetary value of the detriment). There was not one consistent dataset that could be drawn upon to estimate the average selling price of all the product categories included in the model. Depending on the product category, one of three data sources may be used to estimate the selling price:

- Statista's Consumer Market Outlook
- ONS PRODCOM Manufacturers' Sales data
- A web-sweep of prices undertaken by OPSS

[48] The Product Safety Risk Assessment Methodology (PRISM) is used by market surveillance authorities and enforcing authorities in Great Britain with responsibility for consumer product safety. More information is available here: PRISM Guidance.

8.13 Statista's Consumer Market Outlook provides information on the value and volume of consumption in different consumer markets in the UK. The PRODCOM data also provides the value and volume of manufacturers' sales for different industries. For both of these sources, the average selling price for each product category is calculated by dividing the total value of sales by the total volume of sales.

8.14 The web-sweep of prices focussed on 5 to 10 types of products within each product category (e.g., *prams*, *highchairs* etc. for the *Childcare products* category). These products were used as search terms on a large online marketplace. The prices of 5 to 10 products listed at the top of each search were recorded. Once 50 data points were collected for each product category, the median retail price was calculated (to avoid any potential skew caused by outliers). Limiting to 5-10 products per category may skew the median as some of the categories include products from a wide range of price points (e.g., cosmetics, sporting articles and equipment, and tools and machinery).

8.15 The above three data sources were combined to ensure that the best estimate of the average price was used for each product category. (NB, given the diversity of products within the "*Construction Products*" and "*Other products*" categories, it was not possible to find sensible estimates of the average selling prices for these categories. Therefore, for these two categories we are unable to value this detriment.)

8.16 Where available, prices calculated from Statista's Consumer Market Outlook are prioritised. The reason for this is that this data best reflects the variety of retail prices across the different products within the product category and the different retailers that will sell the product. Where this data is not available, gaps are filled using either calculated prices from the PRODCOM data or the median prices from the web-sweep.

Time loss due to replacing products due to physical harm or property damage

8.17 Physical harm or property damage due to unsafe and non-compliant products can have wider impacts on the affected consumers. As well as potentially bearing the cost of replacing the product, they might also suffer time loss from having to do so. We estimate the cross-product average monetary value of time loss associated with replacing a product due to experiencing physical harm (or property damage). We split the average time spent per problem, 9.4 hours, reported by Citizens Advice (2016), into 5.9 hours (62.5%) of leisure time and 2.3 hours (24.1%) of work time associated with lost earnings. (NB, the other 13.4% of time spent per problem is *"Other work time"*, which does not result in a loss of earnings).

8.18 We combine the average time loss of each type per problem with the relevant estimated monetary value per hour. For work time associated with a loss of income, the monetary value used is the mean hourly UK wage (in 2022 prices), at £18.71 per hour.[49] Following the standard approach adopted in the academic literature[50], the value of leisure time (in 2022 prices) is estimated at £6.20 per hour, which corresponds to one third of the mean hourly value of work time.

8.19 Hence, the cross-product value of time loss is estimated at £79.03 per problem (equal to £18.71 per hour multiplied by 2.3 hours of work time, plus £6.20 per hour multiplied by 5.9 hours of leisure time[51]).

[49] The 2022 figure is drawn from the ONS Annual Survey of Hours and Earnings (ASHE), Table 21.5a

[50] The following studies relate to valuing leisure time in demand models: Amoako-Tuffour and Martinez-Espineira (2008), Hellerstein and Mendelsohn (1993), Englin and Cameron (1996), Liston-Heyes and Heyes (1996), Bin et al. (2005), and Hagerty and Moeltner (2005).

[51] Any discrepancy in the calculation is due to rounding.

8.20 The probability of time loss from replacing a product due to physical harm or property damage is equal to the probability of replacing the product (NB, in other words, the model assumes that consumers always lose time when replacing a product).

Business detriment calculations

Cost for businesses of a recall

8.21 If unsafe and non-compliant products that get into circulation are discovered and need to be recalled, this results in costs to businesses. Some of these costs will be direct financial costs to the relevant businesses across the product recall process. These include costs of investigating the issue, communicating with the public, refunding customers (or replacing or modifying products), legal fees and liability, and settlement costs (GMA, 2011; NTS, 2014 & 2018).

8.22 Typically, the manufacturer will be responsible for the recall costs and sometimes the retailer may bear smaller administration and communication costs to mitigate any reputational damage on their business. However, if the product is supplied from abroad through an untraceable supply chain, the costs are difficult to recoup and could be borne by the Local Trading Standards Authority, or it may be impossible for consumers to seek redress.

8.23 For simplicity, in the modelling it is assumed that supply chains are traceable so the costs of a recall fall onto businesses in the supply chain (be it a manufacturer, retailer, or distributor of the product). The government or consumer does not bear the financial costs of recalls (although, time spent by consumers dealing with recalls is included in the model as a consumer detriment).

8.24 Much of the literature describes recall costs qualitatively but does not publish information on their magnitude. However, when a recall occurs involving a listed company they may make a provision for the costs of the recall in their financial accounts. These accounting provisions give us an estimate of the costs to businesses of a product recall.

8.25 For example, Whirlpool Corporation recalled **574,500** of its washing machines units[52] (sold in the UK and Ireland between 2014 and 2018) and made a provision of **$105 million**[53] (**£84.9 million**[54]) for the recall in their accounts. This is equivalent to around **£148** per unit. We estimate that this is approximately **45.6%** of the average selling price of a washing machine, which is approximately **£324**[55].

8.26 Therefore, we use **45.6%** of the average selling price of a product (sourced from either Statista, ONS PRODCOM, or the price web-sweep) as an estimate of the cost to business of recalling that product. Clearly, a limitation of using the estimate of 45.6% (based on one datapoint) is that the costs of this particular recall may not represent other recalls. Specifically, this washing machine recall was large-scale (recalling almost 600,000 units). Therefore, the fixed costs of a recall (e.g. communication and investigation costs) may be disproportionally reflected in this estimate of the cost as a share of the average selling price in comparison that for a smaller product recall.

---

[52] See https://washingmachinerecall.whirlpool.co.uk/faq.jsp?lang=. A formal product recall was firstly initiated for 519,000 units, followed by a further 55,500 units across the UK and Ireland.
[53] See pg. 83, Whirlpool Annual Report 2020, available here.
[54] Uses an average exchange rate between 2014 and 2018 of £1 equals $1.43 (ONS: Average Sterling exchange rate: US Dollar XUMAUSS - Office for National Statistics)
[55] Source: Statista Consumer Market Outlook 2020. Available at: https://www.statista.com/outlook/cmo/household-appliances/major-appliances/washing-machines/united-kingdom?currency=GBP#price

8.27 This monetary value (**45.6%** of the average selling price) is multiplied by the likelihood of the detriment. This likelihood is the probability that an unsafe product is discovered in circulation and a recall is initiated within the product's lifetime. This probability is a challenging parameter to estimate, as data is limited. The US CPSC estimates that **46%** of cases they receive lead to a recall (CPSC, 2017a) so this figure is used as a proxy in the central modelling scenario.

Data limitations

Expected product lifetimes

8.28 An important aspect of the modelling is the time dimension. The benefits from removing unsafe or non-compliant products in a given period will in fact arise, or be spread, over several future periods. For example, an unsafe product that is removed will not pose risks that would otherwise have persisted for the lifetime of that product in consumers' hands.

8.29 Hence, the model accounts for two-time dimensions:

- The period of the intervention. In other words, the year when an unsafe or non-compliant product was removed.
- The periods in which the benefits from removing a product are realised. These periods are assumed to begin from the moment an unsafe or non-compliant product is removed and continue for that product's expected lifespan. Future benefits are discounted in line with the Green Book[56] at a discount rate of 3.5%.

8.30 Regarding the latter, the model uses the likelihoods that detriments occur over the whole lifetime of the product. Regarding the probabilities taken from the PSD, EU guidelines[57] state that the probability of an injury is the probability that an injury may *"materialise during the expected lifetime of the product"*. Therefore, for the purpose of the modelling, these likelihoods (and the benefits they relate to) must be 'distributed' across the product lifespan. This means that a stream of future benefits from removing unsafe or non-compliant products in a given year is calculated by the model.

8.31 Information on product lifetimes (i.e. the number of years that a consumer could expect to use the product before it became obsolete) was sourced from five pieces of literature: Department for Environment, Food and Rural Affairs (2011); Cox et al. (2013); Wieser et al. (2015); EC DG for Internal Policies (2016); and Cooper (2004). A full breakdown of product lifetimes used in the model is provided in Table 11 below:

[56] HM Treasury (2020) The Green Book: Central Government Guidance on Appraisal and Evaluation. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938046/The_Green_Book_2020.pdf

[57] Page 48, COMMISSION IMPLEMENTING DECISION (EU) 2019/417 of 8 November 2018 laying down guidelines for the management of the European Union Rapid Information System 'RAPEX' established under Article 12 of Directive 2001/95/EC on general product safety and its notification system.

Table 11: Product lifetimes used in the model

Product Category	Average Product Lifetime (Years)
Chemicals	6
Childcare products	6
Clothing and accessories	2
Construction Products	6
Cosmetics	6
Electrical appliances	6
Explosives	6
Food imitation products	6
Furniture and furnishings	8
Gas Appliances	12
Laser pointers	6
Lighting and lighting chains	6
Media, communication, IT equipment	5
Medical products/devices	6
Personal protective equipment	6
Pressure Equipment	6
Recreational Craft	6
Sporting Equipment and Articles	4
Tools and machinery	6
Toys	3
Other products	6

Note: The average product lifetimes are drawn from five sources.

8.32 The cross-product average, which is applied to twelve product categories where no specific data was available, is **6 years** (based on all 122 data points from the five sources above). This may under or overestimate the true lifetime for some of these product categories. Therefore, for these product categories, detriments may be under or over discounted in the calculation of the net present value of detriment. (NB, the product specific estimates of product lifetimes range from **2 years** for *Clothing and Accessories* to **12 years** for *Gas appliances*.)

8.33 The main assumption required is how to distribute the benefits (detriments avoided) over a product's lifetime due to the removal of unsafe or non-compliant products. For some detriments, it is clear how this should be done as these are events that occur at a specific (foreseeable) point in time. For example, a displaced sale occurs at the start of the product's lifetime, and a lost future sale due to reputational damage occurs at the end of the product's lifetime when a purchase to replace the product would have occurred.

8.34 However, for other detriments, there is uncertainty regarding when certain events would occur. Therefore, in the central scenario, **we assume that an unsafe or non-compliant product is *equally likely to cause these detriments in each year of its lifetime***. That is, the total likelihood over the product's lifetime of causing one of these detriments is distributed *uniformly* across the product's lifetime. Specifically, for consumers these detriments are:

- Physical harms to consumers;
- Property damage;
- Cost of replacing a product and time loss due to physical harm to consumers;
- Cost of replacing a product and time loss due to damage to property; and,
- Time loss due to a product recall.

8.35 And for businesses these detriments are:

- Business costs of absent workers;
- Reputational damage from physical harms to consumers;
- Reputational damage from damage to property;
- Insurance payouts for damage to property; and,
- Costs for businesses of a recall.

8.36 In the model, this means dividing the total likelihood by the number of years of the product's lifetime and using the resulting value as the per year likelihood. As a result, for these detriments the model attributes an even proportion of the lifetime benefits to each period between when a product is removed and the expected end of that product's lifetime.

Data matching methods

8.37 As mentioned in Section 5 of the report, due to the wide range of datasets used in the modelling, it was necessary to match categories and variables across datasets. The product matches used in the model are reported in the tables below.

Table 12: Product category matches with Statista Consumer Market Outlook

Model Product category	Statista Consumer Market Outlook Category
Chemicals	Dishwashing Detergents; Household Cleaners; Laundry Care; Polishes, Room Scents & Insecticides; Skin Treatment; Hand Sanitizer; Chemicals
Childcare products	Baby Products
Clothing and accessories	Children's Apparel; Men's Apparel; Women's Apparel; Athletic Footwear; Leather Footwear; Sneakers; Textile & Other Footwear; Watches & Jewellery
Cosmetics	Cosmetics; Fragrances; Personal Care; Skin Care
Electrical appliances	Major Appliances; Small Appliances
Furniture and furnishings	Bedroom Furniture; Floor Covering; Kitchen Furniture; Living-Room & Dining-Room Furniture; Office Furniture; Plastic & Other Furniture
Lighting and lighting chains	Lamps & Lighting

Media, communication, IT equipment	Drones; Telephony; TV Peripheral Devices; TV, Radio & Multimedia; Computing
Medical products/devices	Contact Lenses
Personal protective equipment	Sunglasses
Sporting Equipment and Articles	Sports Equipment
Tools and machinery	Tools and Equipment for House and Gardening
Toys	Toys & Games

Table 13: Product category matches with BIS (2014)

Model Product Category	**BIS (2014) category**
Chemicals	All problems
Childcare products	Personal goods and services
Clothing and accessories	Personal goods and services
Construction products	House fittings and appliances
Cosmetics	Personal goods and services
Electrical appliances	House fittings and appliances
Explosives	All problems
Food imitation products	All problems
Furniture and furnishings	House fittings and appliances
Gas Appliances	All problems
Laser pointers	All problems
Lighting and lighting chains	House fittings and appliances
Media, communication, IT equipment	House fittings and appliances
Medical products/devices	Personal goods and services
Other products	All problems
Personal protective equipment	All problems
Pressure Equipment	All problems
Recreational Craft	Transport
Sporting Equipment and Articles	Leisure
Tools and machinery	Other household requirements
Toys	Leisure

Note: "All problems" covers the whole sample of products and services respondents to the BIS survey declared problems with.

Table 14: Product category matches with OPSS Public Attitudes Tracker

Model Product Category	Public Attitudes Tracker category
Childcare products	Baby products
Cosmetics	Cosmetics
Clothing and accessories	Clothes / clothing accessories
Electrical appliances	White goods; Small kitchen appliance (toaster, kettle, blender, microwave); Vacuum cleaner
Furniture and furnishings	Furniture / furnishings; Homeware, non-electrical
Media, communication, IT equipment	Laptop / tablet/ mobile phone; Charger; Speakers / headphones; Electronic game / console; Smart home device (e.g. Smart speaker/ assistant, smart thermostat)
Sporting Equipment and Articles	Sports and leisure item(s), not including clothes
Tools and machinery	Gardening tools/ equipment
Toys	Toys

Table 15: Product category matches with CPSC Recall Effectiveness data

Model Product Category	CPSC category
Childcare products	Children's Product
Clothing and accessories	Clothing and Accessories
Cosmetics	Personal Care
Electrical appliances	Home Appliances and Maintenance
Furniture and furnishings	Home Furnishings and Décor
Media, communication, IT equipment	Electronics
Sporting Equipment and Articles	Sports and recreation

Table 16: Product category matches with literature on product lifetimes

Model Product Category	Literature on product lifetimes category
Clothing and accessories	General clothing; Shoes; Coats; Sandals; T-Shirt; Shirt/Blouse; Jeans; Winter jacket/Coat; Jeans; Jumper; Coat; Shirt; Shoes; Suit
Electrical appliances	Electric cookers; Refrigerators and freezers; Washing Machines, dishwashers and tumble dryers; Vacuum cleaners and carpet cleaners; Microwave ovens; Small work or personal care appliances; Vacuum cleaners; Washing machines; Kitchen appliances; Refrigerators; Printer; Coffee Machine; Refrigerator; Stove; Electric toothbrush; Kettle; Toaster; Fridge/Freezer; Cooker; Fridge (freezer)

Furniture and furnishings	Bed items; Kitchenware; Curtains; General furniture; Carpets; Beds; Kitchen units; Bathroom; Specific furnishings; Mattress; Couch; Desk; Wardrobe; Cushions; Sofa; Carpet; Kitchen units;
Gas Appliances	Boiler
Lighting and lighting chains	Lighting; Lamp; Table Lamp
Media, communication, IT equipment	Televisions; Hi-fi and stereo; Video equipment; Computers and peripherals; Telephones, faxes, and answerphone machines; Radio and personal radio, stereo and CD; Mobile phones and pagers; Mobile phones; Portable devices; Personal computers; Cameras; Laptop/Notebook; MP3 Player; Computer; Landline-phone
Sporting Equipment and Articles	Specific clothing (e.g. sports); Bicycles
Tools and machinery	Home and garden tools; Power tools
Toys	Toys

Table 17: Product category matches with Border Returns data

Model Product category	**Border Returns Category**
Chemicals	12k Chemicals; 12l Articles Containing Chemicals
Childcare products	2 Childcare Articles (e.g. Baby Walkers, Prams, Soothers, High Chairs)
Clothing and accessories	3 Clothing And Personal Accessories Worn On The Body (e.g Gloves, Shoes, Jewellery, Watches, Piercings)
Construction products	12h Construction Products
Cosmetics	13 Cosmetic Products
Electrical appliances	6a Hair And Body Care Electrical Appliances 6b Electrical Appliances Used In The Kitchen 6c Housekeeping Electrical Appliances 6d Other Electrical Appliances
Explosives	12e Pyrotechnic Articles 12f Explosives For Civil Uses
Food imitation products	12a Food Imitation Product (e.g. Salt Shaker Imitating Fruits, Shampoo In A Soft Drink Tin)
Furniture and furnishings	12c Furniture
Gas Appliances	12d Gas Appliances (e.g. Gas Barbecues, Parasol Patio Heaters)
Laser pointers	12b Laser Pointers
Lighting and lighting chains	7a Christmas Lightning (e.g. Lightning Chains) 7b Non Directional Household Lamps (e.g. Light Bulbs, Leds) 7c Other Luminaires (e.g. Lustres)

Media, communication, IT equipment	8a Mobile Phones 8b Jammers 8c Audio And Video Products (e.g. Dvd Players, Television Sets, Mp3 Players, Playing Consoles) 8d Other It, Telecommunication And Electronic Entertainment Equipment
Medical products/devices	11 Medical Devices (e.g. Contact Lenses, Plasters, Dental Devices, Medical Diagnostic Devices, Condoms)
Other products	12m Other Products
Personal protective equipment	5a Sunglasses 5b Helmets (Excl. Motor Bike Helmets) 5c Protective Clothes And Shoes (Incl. High Visibility Clothing) 5d Life Jackets And Buoyancy Aids (e.g Floating Vests) 5e Other Personal Protective Equipment
Pressure Equipment	12i Pressure Equipment
Recreational Craft	12g Recreational Crafts
Sporting Equipment and Articles	4 Sporting Articles (e.g. Bicycles, Climbing Equipment, Fitness Devices), Excluding Personal Protective Equipment
Tools and machinery	9a Handheld Motor-Operated Tools (e.g. Drills, Grinders, Chain Saws) 9b Tools For Gardening (e.g. Lawn Mowers, Hedge Trimmers) 9c Other Motor-Operated Tools 10 Machinery (e.g. Industrial Machinery)
Toys	1a Toys For Children Under 3 Years 1b Other Toys For Children

Sensitivity tests

8.38 This section provides some additional detail to support the sensitivity analysis presented in the main body of the report. These tests help illustrate the robustness of the central estimates and highlight areas of uncertainty that exists in the model. Providing this further detail ensures transparency in our approach and allows readers to clearly understand the assumptions and implications of the sensitivity tests. This level of clarity is important for interpreting the results.

Sensitivity Test 3: Rate of displacement of sales

8.39 There are various arguments based on economic theory which suggest that the impact on sales of compliant products could be more complex than our 1-for-1 assumption. For example, it is possible that unsafe and non-compliant products are vertically differentiated from compliant ones and so do not compete with them directly. That is, consumers who buy the non-compliant products may not necessarily buy the compliant one. In this case, the displacement rate may be closer to zero than 1-for-1 assumption.

8.40 Another possibility is that the availability of non-compliant products may deter producers from producing and entering the market for that product. In this case, there may be a

deterrence multiplier effect, such that each unsafe or non-compliant product results in more than one lost sale. Given these theoretical arguments, in this sensitivity test we apply two alternatives to the 1-for-1 assumption. Specifically, we apply a lower bound of **0.5 (50%)** and an upper bound of **2 (200%)** instead of the **100%** probability applied in the central analysis. Please note that these lower and upper values are used to observe to what extent the final outputs rely on the 1-for-1 assumption.

Sensitivity Test 4: Alternative assumption about the repurchase rate

8.41 The assumption that if someone experiences physical harm from a product and that product is a non-essential item then they will not repurchase it may not hold. Specifically, even in these circumstances some consumers may decide to purchase the product again.

8.42 Therefore, in an alternative modelling assumption we apply a further multiplier to the probability that this detriment occurs. This multiplier corresponds to the share of non-essential products that would not be repurchased due to the consumer experiencing harm.

8.43 An estimate of this can be derived from BIS (2014), which tells us to what extent experiencing "a problem" with a product impacts the likelihood that consumers will repurchase that product (subject to the product being discretionary). This is based on the survey question: *"To what extent, if at all, would you say the problem has had any effect on your likelihood of purchasing [insert the same product or service as previous question] in the future?"*, with answer options *"A great deal"*, *"A fair amount"*, *"A little"* and *"None"*. (NB, this survey question was only asked to consumers in relation to discretionary products.) The results of this question are presented in Table 18.

8.44 It is unlikely that all unsafe and non-compliant products will come to the attention of market surveillance authorities, the likelihood that a product is recalled used in the central analysis (46%) could be an overestimate. The extent that it is an overestimate is unknown, as we cannot know the proportion of unsafe products that go unreported. We use the results of this question to derive an estimate of the percentage of consumers that would NOT repurchase a product due to experiencing a problem with it (subject to the product being discretionary). We do this by making assumptions about how the categorical answers to the question correspond to the likelihood of repurchase. These assumptions are as follows:

- *"A great deal"* corresponds to a 0% likelihood of repurchase (i.e., the consumer will not repurchase the product in future);
- *"A fair amount"* corresponds to a one-third (33.3%) likelihood of repurchase;
- *"A little"* corresponds to a two-thirds (66.7%) likelihood of repurchase; and
- *"None"* corresponds to a 100% likelihood of repurchase (i.e., the consumer will repurchase the product in future).

8.45 In other words, the full range of possible likelihoods of repurchase (0% to 100%) is divided into equal increments across the four responses to the question. With these assumptions we can compute the average likelihood of repurchase, which is **52%**. This is calculated by multiplying together the two values in each row of Table 18, then summing across the rows. By subtracting this from 1, we then have an estimate of the share of consumers that would NOT repurchase a product due to experiencing a problem with it: **48%.**

8.46 The percentage of products that are discretionary (**55%**) and the share of consumers that would not repurchase a product due to experiencing a problem with it (**48%**) are multiplied together. This provides our alternative cross-product estimate of the likelihood

that a consumer would not repurchase the same product again if they previously experienced physical harm due to this product: **26%**. (NB, product specific estimates ranged from **22%** for "*Other household requirements*" to **35%** for "*Household fittings and appliances.*") [58]

Table 18: Survey evidence on extent that experiencing a problem with a product affects the likelihood that consumers will repurchase it, and corresponding model assumptions

Answer to survey question (BIS 2014 survey)	Share of respondents (BIS 2014 survey)	Assumed likelihood of repurchase for model
"A great deal"	17%	0%
"A fair amount"	23%	33.3%
"A little"	45%	66.7%
"None"	14%	100%

Sensitivity Test 6: Likelihood of a recall

8.47 It is unlikely that all unsafe and non-compliant products will come to the attention of market surveillance authorities, the likelihood that a product is recalled used in the central analysis (46%) could be an overestimate. The extent that it is an overestimate is unknown, as we cannot know the proportion of unsafe products that go unreported.

8.48 From the PAT survey, information is available on actions that consumers took when they became aware of a safety issue with a product. The PAT survey shows that 75% of consumers took some form of action (e.g., returning the product), and 10% complained to the manufacturer. The latter (complaining to the manufacturer) should bring any (genuine) safety issue to the attention of market surveillance authorities, whereas other actions (e.g., returning the product) may also do so. Hence, these two figures are used as multipliers in two sensitivity analyses. Specifically, the 46% figure (in the previous paragraph) is multiplied by 0.75 in one sensitivity analysis (equalling 34.5%), and by 0.1 in another sensitivity analysis (equalling 4.6%).

Key definitions

8.49 The definitions presented in the table below reflect official legal terminology from the GPSR 2005 (Section 2) where relevant, relevant product-specific legislation and OPSS guidance. Throughout this report, we use simplified modelling terms – such as "unsafe" and "non-compliant" – to describe a broad range of issues that may lead to regulatory intervention. **These simplified terms are not to be relied for compliance or enforcement decision and are used solely for analytical purposes and do not replace or reinterpret or override statutory definitions, which are provided below for clarity.**

[58] Please note: All percentages presented in paragraphs 8.45 and 8.46 have been rounded to the nearest whole percent.

Table 19: Product safety key definitions

Key term	Statutory definition
Product	A product which is intended for consumers or likely, under reasonable foreseeable conditions, to be used by consumers even if not intended for them and which is supplied or made available for consideration or not, in the course of a commercial activity and whether it is new, used or reconditioned and includes a product that is supplied or made available to consumers for their own use in the context of providing a service. “Product” does not include equipment used by service providers themselves to supply a service to consumers, in particular equipment on which consumers ride or travel which is operated by a service provider.
Safe product	A product which, under normal or reasonably foreseeable conditions of use including duration and, where applicable, putting into service, installation and maintenance requirements, does not present any risk or only the minimum risks compatible with the product’s use, considered to be acceptable and consistent with a high level of protection for the safety and health of persons.
Dangerous product	A product other than a safe product.
Serious risk	A serious risk, including one the effects of which are not immediate, requiring rapid intervention.
Distributor	A professional in the supply chain whose activity does not affect the safety properties of a product.
Producer	a. The manufacturer of a product, when he is established in the UK and any other person presenting themself as the manufacturer by affixing to the product their name, trademark or other distinctive mark, or the person who reconditions the product. b. Where the manufacturer is not established in the UK (i) if he has a representative established in the UK, the representative. (ii) in any other case, the person established in the UK that places a product from a country outside the UK on the market. c. Other professionals in the supply chain, insofar as their activities may affect the safety properties of a product.
The definitions below are non-statutory and reflect terms used within OPSS’s risk lexicon and related OPSS guidance and methodologies (including PRISM). They represent accepted and commonly understood risk terminology used in the report but are not defined in legislation.	

Compliant product	A safe product that under normal or reasonably foreseeable use, presents no risk or only the minimum risks considered acceptable, allowing consumers to assess and guard against them and includes producer details for traceability. Note: It is possible that a compliant product may be considered unsafe.
Non-compliant product	A product that does not meet the requirements of the applicable product safety regulations
Hazard	Definition: A potential source of harm. Note: This is a wide definition that includes products, substances, processes, premises, infrastructure and activities. The level of a hazard will be determined by the nature of the harm it can cause (in terms of its severity) and the anticipated extent of that harm (for example in terms of the number of people that could be affected). The EU Rapex guidelines provide the following definition: "Hazard is the intrinsic property of the product that may cause an injury to the consumer who uses the product."[59]
Harm	Definition: Adverse impact on individuals, the environment, infrastructure, property, animals, or businesses, and which can include human injury and ill health, damage (including disruptions) to property, damage to the environment, or economic loss. Note: This is a wide definition that includes physical, mental, social and economic adverse impacts. It can also extend to the failure to deliver a benefit or preventing a benefit from being realised.[60]
Risk	Definition: A function of the level of a hazard and the likelihood (or probability) that the hazard will cause harm. Note: In some regulatory contexts, the likelihood of compliance / non-compliance is used as a proxy for the likelihood of a hazard causing harm. Risk is an event that can have negative impact (harm). Conversely an event that can have a positive impact (benefit) is an opportunity, so any situation in which the consequences can be identified beforehand, or assessed post event, in terms of positive and negative impact will, by definition, be classified as either risks or opportunities.[61]

[59] OPSS risk lexicon - GOV.UK
[60] OPSS risk lexicon - GOV.UK
[61] OPSS risk lexicon - GOV.UK

Risk assessment	Definition: The process by which the level of risk associated with a particular hazard is identified and categorised. Note: The categorisation process normally allows comparisons to be made between different hazards.[62]
Product Safety Risk Assessment Methodology (PRISM)	The risk assessment methodology for use by GB market surveillance and enforcement authorities for regulating consumer product safety.
Risk tolerability	Definition: The acceptability of a perceived risk based upon the current values of society. Note: The degree to which a risk is tolerable will usually be influenced by the associated benefits derived and the degree to which it is seen as being effectively controlled and managed.[63]
Acceptable risk	A risk that is in balance with the function of the product, that arises from compliant products.
Tolerable risk	An identified risk in a non-compliant product that should not be there, but that has been assessed as expected to be tolerable to the public.
Intolerable risk	An identified risk in a non-compliant product that has been assessed as not expected to be accepted by the public, which the regulator must take action to bring into compliance or remove from the market.

[62] OPSS risk lexicon - GOV.UK
[63] OPSS risk lexicon - GOV.UK

Acronyms used

Table 20: Acronyms used

ACCC	Australian Competition and Consumer Commission
ADHD	Attention Deficit Hyperactivity Disorder
ATV	All-terrain vehicles
BIS	Department for Business, Innovation and Skills
BR	Borders Return
CPSC	Consumer Product Safety Commissions
EC DG GROW	European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
ED	Emergency Department
GPSR	General Product Safety Regulations
HSE	Health and Safety Executive
ICU	Intensive Care Unit
KPMG	Klynveld Peat Marwick Goerdeler
NB	Nota Bene
ONS	Office for National Statistics
OPSS	Office for Product Safety and Standards
PAT	Public Attitudes Tracker
PRISM	Product Safety Risk Assessment Methodology
PRODCOM	PRODuction COMmunautaire
PSD	Product Safety Database
QTR	Queensland Trauma Registry
RAPEX	Rapid Alert System for dangerous non-food products
SUV	Sport Utility Vehicle

Bibliography

Australian Competition and Consumer Commission (ACCC), (2019) ‘Unsafe goods should be illegal to sell’. Unsafe goods should be illegal to sell | ACCC

Pacific Institute for Research and Evaluation, (2018) ‘The Consumer Product Safety Commissions Revised Injury Cost Model’. https://www.cpsc.gov/s3fs-public/ICM-2018-Documentation.pdf

Watson, W.L. and Ozanne-Smith, J., 2006**.** *Consumer product-related injury in Australia: direct hospital & medical costs to government*. Report No. 083. Monash University Accident Research Centre. https://www.monash.edu/__data/assets/pdf_file/0004/217399/muarc083.pdf

Lang J, Dallow N, Lang A, Tetsworth K, Harvey K, Pollard C, Bellamy N (2014) Inclusion of 'minor' trauma cases provides a better estimate of the total burden of injury: Queensland Trauma Registry provides a unique perspective. https://pubmed.ncbi.nlm.nih.gov/24838189/

Catchpoole, J.M. (2015) *Developing and evaluating approaches for utilising injury data to support product safety initiatives*. PhD thesis. Queensland University of Technology. https://eprints.qut.edu.au/82805/1/Jesani%20Mitsuko_Catchpoole_Thesis.pdf

Shapiro, S., Ruttenberg, R., & Leigh, P. (2008). ‘The social costs of dangerous products: an empirical investigation’ ."The Social Costs of Dangerous Products: An Empirical Investigation" by Sidney Shapiro, Ruth Ruttenberg et al.

European Commission, Directorate-General for Enterprise and Industry, (2012) *European competitiveness report 2012 : reaping the benefits of globalization*. https://data.europa.eu/doi/10.2769/68300

European Commission (2017) Consumer detriment study: final report. Brussels: Directorate-General for Justice and Consumers. https://commission.europa.eu/document/download/a48e1d90-6728-4e46-bf64-6f0e9f15a935_en?filename=con…

Department for Business, Innovation and Skills (BIS) (2014) Consumer Engagement and Detriment Survey 2014. https://assets.publishing.service.gov.uk/media/5a7df47ced915d74e6223281/bis-14-881-bis-consumer-detriment-survey.pdf

Citizens Advice (2016). *Consumer detriment: Counting the cost of consumer problems*. https://assets.ctfassets.net/mfz4nbgura3g/1Zth1S8KggHyLqPtKhiP6d/b658155e2702a980c4d4a6afe853769c/Final_ConsumerDetriment_OE.pdf

Magno F. (2012). ‘Managing product recalls: The effects of time, responsible vs. opportunistic recall management and blame on consumer’s attitudes’. Managing Product Recalls: The Effects of Time, Responsible vs. Opportunistic Recall Management and Blame on Consumers’ Attitudes

Chen,Y., Ganesan, S., & Liu, Y. (2009). ‘Does a Firm’s Product-Recall Strategy Affect Its Financial Value? An Examination of Strategic Alternatives During Product-Harm Crises’. Does a Firm's Product-Recall Strategy Affect Its Financial Value? An Examination of Strategic Alternatives During Product-Harm Crises | Request PDF

Lloyds of London and KPMG (2020).Safeguarding reputation - Lloyd's

University of Washington Foster School of Business (2015). ‘Social media amplifies damage of product recalls to firms—and their rivals’ (web article). Social media amplifies damage of product recalls to firms — rivals, too | UW News

Australian Government (2019). ‘Improving the Effectiveness of the Consumer Product Safety System’. Consultation Regulation Impact Statement - Improving the effectiveness of the Consumer Product Safety System

Heidhues, P., Kőszegi, B., & Murooka, T. (2017). ‘Inferior Products and Profitable Deception’. Inferior Products and Profitable Deception* | The Review of Economic Studies | Oxford Academic

Food Standards Agency (2020). ‘The Burden of Foodborne Disease in the UK 2018’. Available at: https://www.food.gov.uk/research/research-projects/the-burden-of-foodborne-disease-in-the-uk-2018

Contact us if you have any enquiries about this publication, including requests for alternative formats, at: OPSS.enquiries@businessandtrade.gov.uk

Office for Product Safety and Standards

Department for Business and Trade,
4th Floor, Multistory, 18 The Priory Queensway, Birmingham B4 6BS

Office for Product Safety and Standards - GOV.UK