Title: Banning the Sale of Energy Drinks to Children Impact Assessment **IA No:** 13008 **Lead department or agency:** Department of Health and Social Care (DHSC) **Other departments or agencies:**	**Impact Assessment (IA)** **Date:** 29/08/2018 **Stage:** Consultation **Source of intervention:** Domestic **Type of measure:** Secondary Legislation **Contact for enquiries:** Email: Childhood.Obesity@dh.gsi.gov.uk Childhood Obesity Team Department of Health and Social Care 6th Floor, 39 Victoria Street London SW1H 0EU

Summary: Intervention and Options

RPC Opinion: Not Applicable

Cost of Preferred (or more likely) Option 2				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANCB on 2014 prices)	**In scope of Business Impact Target**	**Measure qualifies as**
- £70m	- £115m	£12.0m	Yes	N/A

What is the problem under consideration? Why is government intervention necessary?

We are hearing strong calls from parents, health professionals, teachers, and some industry bodies and retailers for an end to sales of high-caffeine energy drinks to children. Evidence suggests that excessive consumption of energy drinks by children is linked to negative health outcomes such as headaches, sleeping problems, irritation, and tiredness, and current rules require that energy drinks containing over 150mg of caffeine are labelled as 'not recommended for children'. Many larger retailers and supermarkets have voluntarily stopped selling energy drinks to under-16s, but there are still many retailers that continue to sell these drinks to children.

What are the policy objectives and the intended effects?

The aim of the policy is to prevent excessive consumption of high-caffeine energy drinks by children, to mitigate the potential negative effects of this behaviour on children's health.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

Option 1: Do nothing

Option 2: Statutory regulation banning under-16 sales

Option 3: Statutory regulation banning under-18 sales

Will the policy be reviewed? N/A

Does implementation go beyond minimum EU requirements?			Yes		
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	**Micro** Yes	**< 20** Yes	**Small** Yes	**Medium** Yes	**Large** Yes
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:**	**Non-traded:**	

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible:
Matt Hancock MP

Date: 29/08/2018

Summary: Analysis & Evidence

Policy Option 1

Description: Do Nothing

FULL ECONOMIC ASSESSMENT

Price Base Year x	PV Base Year x	Time Period Years x	Net Benefit (Present Value (PV)) (£m)		
			Low:	**High:**	**Best Estimate: £0m**

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low		0		
High				
Best Estimate	£0m		£0m	**£0m**

Description and scale of key monetised costs by 'main affected groups'

These are defined to be 0

Other key non-monetised costs by 'main affected groups'

These are defined to be 0

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low		0		
High				
Best Estimate	£0m		£0m	**£0m**

Description and scale of key monetised benefits by 'main affected groups'

These are defined to be 0

Other key non-monetised benefits by 'main affected groups'

These are defined to be 0

Key assumptions/sensitivities/risks

N/A

Discount rate N/A

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: 0	**Benefits: 0**	**Net: 0**	0

Summary: Analysis & Evidence

Policy Option 2

Description: Statutory regulation banning under-16 sales of energy drinks

FULL ECONOMIC ASSESSMENT

Price Base Year 2017	PV Base Year 2017	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low:	**High:**	**Best Estimate: - £70m**

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low		1		
High				
Best Estimate	£0.04m		£33m	**£285m**

Description and scale of key monetised costs by 'main affected groups'

Government: There are some costs of enforcement.

Retailers: There are relatively small administration and lost sales costs for retailers. Administrative and transition costs are small as the process is expected to be similar to other restricted products. Lost sales costs are mitigated by an assumption that foregone energy drink spend shall be displaced with other sales.

Energy Drink Manufacturers: There are significant costs to energy drinks manufacturers that will no longer make sales to under-16s.

Some administrative and lost sales costs are mitigated by the significant voluntary action in this space already.

Other key non-monetised costs by 'main affected groups'

All considered costs are monetised.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low		0		
High				
Best Estimate	£0m		£25m	**£215m**

Description and scale of key monetised benefits by 'main affected groups'

Non-energy Drink Manufacturers: It is assumed 90% of lost energy drink sales are displaced. This means there will be a benefit to other manufacturers.
Other Businesses: It is assumed that children spend their entire fixed energy drinks budget in the UK economy. The remaining 10% not directly displaced will come as an indirect benefit to other businesses.

Other key non-monetised benefits by 'main affected groups'

Children: There is observational evidence of health decrements from caffeine consumption (such as headaches, sleeping problems, irritation and tiredness); however we do not expect to have any evidence robust enough to quantify these impacts due to the ethics of a caffeine randomised control trial on children. A ban on energy drinks will reduce their caffeine intake, reducing the associated health decrements.

A displacement from energy drinks to other soft drinks would result in a decrease in calorie consumption. This would contribute to reductions in obesity rates and incidence of dental caries in children.

NHS: A reduction in the obesity rate would be expected to yield cost savings to the NHS. The potential obesity benefits are uncertain and only contained in the breakeven analysis.

Key assumptions/sensitivities/risks **Discount rate** 3.5%

- Sales are displaced to other non-energy drink products.
- Voluntary action is sustained for the lifetime of the appraisal period.
- It is uncertain how soon and to what scale health benefits would be observed. They remain unmonetised.

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: £29.5m	**Benefits: £17.5m**	**Net: - £12.0m**	£60.1m

Summary: Analysis & Evidence

Policy Option 3

Description: Statutory regulation banning under-18 sales of energy drinks

FULL ECONOMIC ASSESSMENT

Price Base Year 2017	PV Base Year 2017	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low:	**High:**	**Best Estimate: - £70m**

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low		1		
High				
Best Estimate	£0.04m		£57.0m	**£490m**

Description and scale of key monetised costs by 'main affected groups'

Government: There are some costs of enforcement.

Retailers: There are relatively small administration and lost sales costs for retailers. Administrative and transition costs are small as the process is expected to be similar to other restricted products. Lost sales costs are mitigated by an assumption that foregone energy drink spend shall be displaced with other sales.

Energy Drink Manufacturers: There are significant costs to energy drinks manufacturers that will no longer make sales to under-18s.

There are no voluntary sales restrictions taking place for 16 and 17 year olds and 16 and 17 year olds are the highest consumers of energy drinks. This means there are significant additional industry costs beyond action already taking place.

Other key non-monetised costs by 'main affected groups'

All considered costs are monetised.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low		0		
High				
Best Estimate	£0m		£48m	**£420m**

Description and scale of key monetised benefits by 'main affected groups'

Non-energy Drink Manufacturers: It is assumed 90% of lost energy drink sales are displaced. This means there will be a benefit to other manufacturers.
Other Businesses: It is assumed that children spend their entire fixed energy drinks budget in the UK economy. The remaining 10% not directly displaced will come as an indirect benefit to other businesses.

Other key non-monetised benefits by 'main affected groups'

Children: There is observational evidence of health decrements from caffeine consumption. A ban on energy drinks will reduce caffeine intake, reducing the associated health decrements (such as headaches, sleeping problems, irritation and tiredness). The health decrements associated with caffeine are expected to decrease with age and body weight, meaning extending the ban to 16 and 17 year olds may have smaller additional benefits.

A displacement from energy drinks to other soft drinks would result in a decrease in calorie consumption based on our analysis. This would contribute to reductions in obesity rates and incidence of dental caries in children.

NHS: A reduction in the obesity rate would be expected to yield cost savings to the NHS. The potential obesity benefits are uncertain and only contained in the breakeven analysis.

Key assumptions/sensitivities/risks **Discount rate** 3.5%

- Sales are displaced to other non-energy drink products.
- It is uncertain how soon and to what scale health benefits would be observed. They remain unmonetised.

BUSINESS ASSESSMENT (Option 3)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: £50.9m	**Benefits: £34.2m**	**Net: £16.7m**	£83.5m

Contents

1.0 Policy Rationale

Policy Context

1. This proposed ban of the sale of energy drinks to children is being considered as part of a wider set of policies included in the Government's *Childhood Obesity: A plan for action – Chapter 2*, published in June 2018. The plan sets out the Government's national ambition to halve childhood obesity by 2030 and significantly reduce the gap in obesity between children from the most and least deprived areas[1].

2. The proposals outlined in Chapter 2 include consulting on mandatory calorie labelling in the out-of-home sector, restricting price and location promotions, encouraging further action in local areas and in schools and further restrictions on the marketing of HFSS products to children.

3. The proposed policies will help parents make the best decisions for their families by changing the default in the food environment, so that healthier choices become the easiest choices. Chapter 2 builds on the first chapter of the plan, both to cement the action already taken, and to take action in other areas. In August 2016, the Government launched the first part of its plan for action[2]. This comprehensive plan aims to help children and families make healthier choices and be more active. Key measures in the plan included a soft drinks industry levy (SDIL), a sugar reduction and wider reformulation programme, and a commitment to helping children enjoy an hour of physical activity every day.

Problem under Consideration

4. There is growing concern about the effects on the health and behaviour of children and young people resulting from the consumption of energy drinks.

5. Literature shows caffeine and other ingredients found in energy drinks may have effects on children's health and wellbeing (see para 157). Anecdotal evidence and results of a teaching union survey suggests consumption during school time may disrupt learning.

6. A study by the European Food Safety Authority (EFSA)[3] shows that more than two thirds of UK adolescents (10-17 year olds) are drinking energy drinks and that they are typically drinking more than 50% more than the EU average for that age group.

7. DH analysis has shown energy drinks contain significantly more sugar than other full sugar soft drinks (see para 193). Energy drinks also contain high levels of caffeine and other ingredients.

8. Under EU Food Information Regulation (Regulation (EU) No. 1169/2011), manufacturers are currently compelled to label all drinks containing over 150mg of caffeine as 'unsuitable for children and pregnant or breastfeeding women' with some exceptions (see para 40). However, there is no statutory obligation to prevent children purchasing or consuming these products.

Rationale for Intervention

9. All major UK supermarkets and Boots have agreed to voluntarily stop the sale of energy drinks to under-16s.

10. However, anecdotal evidence suggests that many children purchase energy drinks whilst travelling to school. When looking at the UK grocery market, including corner shops, only 21% of locations are signed up to the voluntary ban. These figures exclude other locations such as non-grocery retailers, petrol forecourts and vending machines.

11. Whilst there may be some additional voluntary action (see para 61), the current voluntary action does not sufficiently prevent the opportunity for children to buy energy drinks to address the

[1] Childhood obesity: a plan for action, chapter 2 is available at: https://www.gov.uk/government/publications/childhood-obesity-a-plan-for-action-chapter-2 accessed 29/06/2018

[2] Childhood obesity: a plan for action is available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/546588/Childhood_obesity_2016__2__acc.pdf accessed 29/06/2018

[3] Zucconi, S., Volpato, C., Adinolfi, F., Gandini, E., Gentile, E., Loi, A., & Fioriti, L. (2013). Gathering consumption data on specific consumer groups of energy drinks. *EFSA Supporting Publications*, *10*(3).

concerns outlined above. Additionally, there is no evidence to suggest this voluntary ban will be sustained in the future.

12. Legislating to end the sale of high-caffeine energy drinks to children would create a level playing field for businesses and create consistency, helping ensure that children are not able to purchase energy drinks.

Policy Objective

13. The policy objective is to prevent excessive consumption of high-caffeine energy drinks by children, to mitigate the potential negative effects of this behaviour on children's health.

14. Energy drinks are a cheap, readily available source of caffeine and sugar. Banning their consumption would support the policy objective as well as supporting the wider Childhood Obesity Plan.

2.0 Policy Options Considered

Option 1: Do Nothing

15. The Soft Drinks Industry Levy (SDIL) will likely increase the retail prices of energy drinks containing sugar. We expect this will partially reduce their consumption; however this will not eliminate consumption of sugar containing energy drinks and the market has many sugar free energy drinks which still contain high levels of caffeine and other stimulants.

16. Following media attention and a public campaign, all major supermarkets have agreed to ban the sale of drinks containing over 150mg of caffeine to under-16s, however many independent retailers may not voluntarily restrict sales. As many major retailers have now voluntarily subscribed to the ban, we believe voluntary action has progressed as far as it is feasible to expect.

17. As voluntary action is not a unilateral approach, doing nothing will still allow under-16s access to drinks with high levels of caffeine, meaning the policy objective is not achieved.

Option 2: Statutory regulation banning under-16 sales

18. A statutory ban on the sales of energy drinks to under-16s in all locations would prevent under-16s purchasing energy drinks, which will reduce their consumption achieving the policy objective.

19. Retailers that have already imposed voluntary bans have used the age of 16, so adopting this age limit for a statutory ban would mean that these retailers could continue to use existing processes to implement it.

20. This policy option would have an impact on businesses through administration costs and lost sales revenue, net of the voluntary action already in place. We have considered this with the best available evidence for manufacturers and retailers.

Option 3: Statutory regulation banning under-18 sales

21. We should consider what the appropriate age to ban energy drinks is. Sales of some other restricted substances, such as alcohol and tobacco, are restricted for those under the age of 18.

22. Latvia and Lithuania have already banned the sale of energy drinks to children and have used the age limit of 18.

23. Banning energy drinks to under-18s would have a significantly higher industry cost due to no current voluntary action.

Alternative Options Considered

24. In addition to the policy option under consideration in this Impact Assessment, several other options to achieve the policy objectives have been considered and not quantified. The table below sets out our consideration of these alternative options. We will consider evidence from the consultation and assess if these need revisiting and fully quantifying at the final stage.

Option	Consideration
A minimum price for energy drinks that contain 150mg/l of caffeine or more	• This would impact upon consumers of all ages, rather than affecting only children. The impact on adults could be considered disproportionate given the policy objective is to limit children's consumption • This may not restrict children's consumption and so would not necessarily tackle issue over high levels of consumption and linked health impacts amongst children

A levy upon energy drinks that contain 150mg/L of caffeine or more	• Energy drinks with added sugar are already in scope of the Soft Drinks Industry Levy that came into force on the 6th April. The aim of the levy is to incentivise reformulation to reduce sugar content in drinks. • Responses to the soft drinks industry levy have been strong, with 49% of sugary soft drinks being reformulated. • A caffeine levy would impact upon consumers of all ages, rather than affecting only children. The impact on adults could be considered disproportionate given the policy objective is to limit children's consumption • This may not restrict children's consumption and so would not necessarily tackle issue over high levels of consumption and linked health impacts amongst children.
A limited portion size for individual servings of energy drinks	• The size of the can does not indicate the level of caffeine the product contains; small cans may still have high concentrations of caffeine. • It may not restrict children's consumption and so would not necessarily tackle issue over high levels of consumption and linked health impacts amongst some groups of children. • This would impact upon consumers of all ages, rather than affecting only children. The impact on adults could be considered disproportionate given the policy objective is to limit children's consumption.
Limit the level of caffeine that can be contained in one portion	• This may not restrict children's consumption and so would not necessarily tackle issue over high levels of consumption and linked health impacts amongst children • This would impact upon consumers of all ages, rather than affecting only children. The impact on adults could be considered disproportionate given the policy objective is to limit children's consumption.
An educational campaign on the impacts of caffeine consumption	• Despite labelling on energy drinks saying that these products are not recommended for children, we know that children are still drinking them. • Health and diet is already featured in the school curriculum at different key stages. • It would be likely to be of limited impact in isolation, but could be important in the implementation of other potential approaches.

Exclusion zones around schools in which the sale of energy drinks to children is restricted	• This may make it harder for children to buy energy drinks before, during or after school. • Children may still be able to buy energy drinks on their way to and from school, and outside of school hours • This would have differential impacts for business, restricting sales only in some shops. This could potentially cause significant unintended consequences.

Option 2: Statutory regulation banning energy drink sales to under-16s

3.0 Summary

25. **It has not been possible to monetise any benefits, however all identified costs have been monetised.** This gives a negative present value for the policy; however there are a range of identified benefits (see para 131).

26. **There is a strong evidence base showing a correlation between energy drink consumption and lower health and wellbeing. The evidence for a causal relationship is limited.** Whilst there is evidence suggesting links between energy drink consumption and anxiety, headaches and low mood, we also know energy drink consumption is linked to unhealthy behaviours and deprivation.

27. **There are likely to be large health benefits from reduced calorie and sugar consumption.** Energy drinks are exceptionally high in sugar and calories when compared to likely substitutes, meaning we would expect a ban to have significant health benefits.

3.0.1 Summary Tables

28. These are the monetised cost and benefits of this policy option. Figures are modelled over the standard appraisal cycle of 10 years at a discount rate of 3.5%. The sum of these discounted figures is summed and itemised below as a present value.

29. Other policies in the Childhood Obesity Chapter 2 programme are appraised over 25 years where health benefits have been monetised. See Annex A for these costs modelled over 25 years.

Total NPV (10 year)	-£70m
Costs	**Present Value**
Familiarisation Costs	£41k
On-going Admin Costs	£68m
Enforcement Costs	£2.3m
Lost markup to retailers	£28m
Lost markup to energy drink manufacturers	£187m
Benefits	£0m
Gained markup to non-energy drink manufacturers	£168m
Gained sales to other businesses (indirect benefit)	£47m

3.0.2 Costs Summary

30. The primary costs come from energy drinks manufacturers losing sales.

31. Retailers will also lose out on a small amount of sales, although we expect much of the money that would have been spent on energy drinks to be spent on other products.

32. The main administrative costs arise from ongoing identification checks when selling energy drinks. There are some limited transition and enforcement costs.

3.0.3 Benefits Summary

33. Where sales have been displaced, we expect children to spend the entirety of their fixed budgets meaning other sectors will gain, either directly or indirectly.

34. The benefits of the policy are the reduction in caffeine consumption, which has been linked to some health decrements. In addition, due to the high levels of sugar in energy drinks, a displacement to other products is expected to lead to a reduction in the consumption of calories. This will yield obesity and dental cavity benefits.

3.0.4 Key Assumptions

35. The most sensitive assumption is that where energy drink sales are banned, children will spend their entirety of their fixed energy drinks budget elsewhere in the UK.

36. We have assumed 90% of this will be spent in the same retailers on other soft drinks. The remaining 10% will be spent elsewhere in the UK economy (see para 91). Whilst we believe this to be realistic for modelling purposes; this is an unsupported assumption that we hope to build upon at consultation.

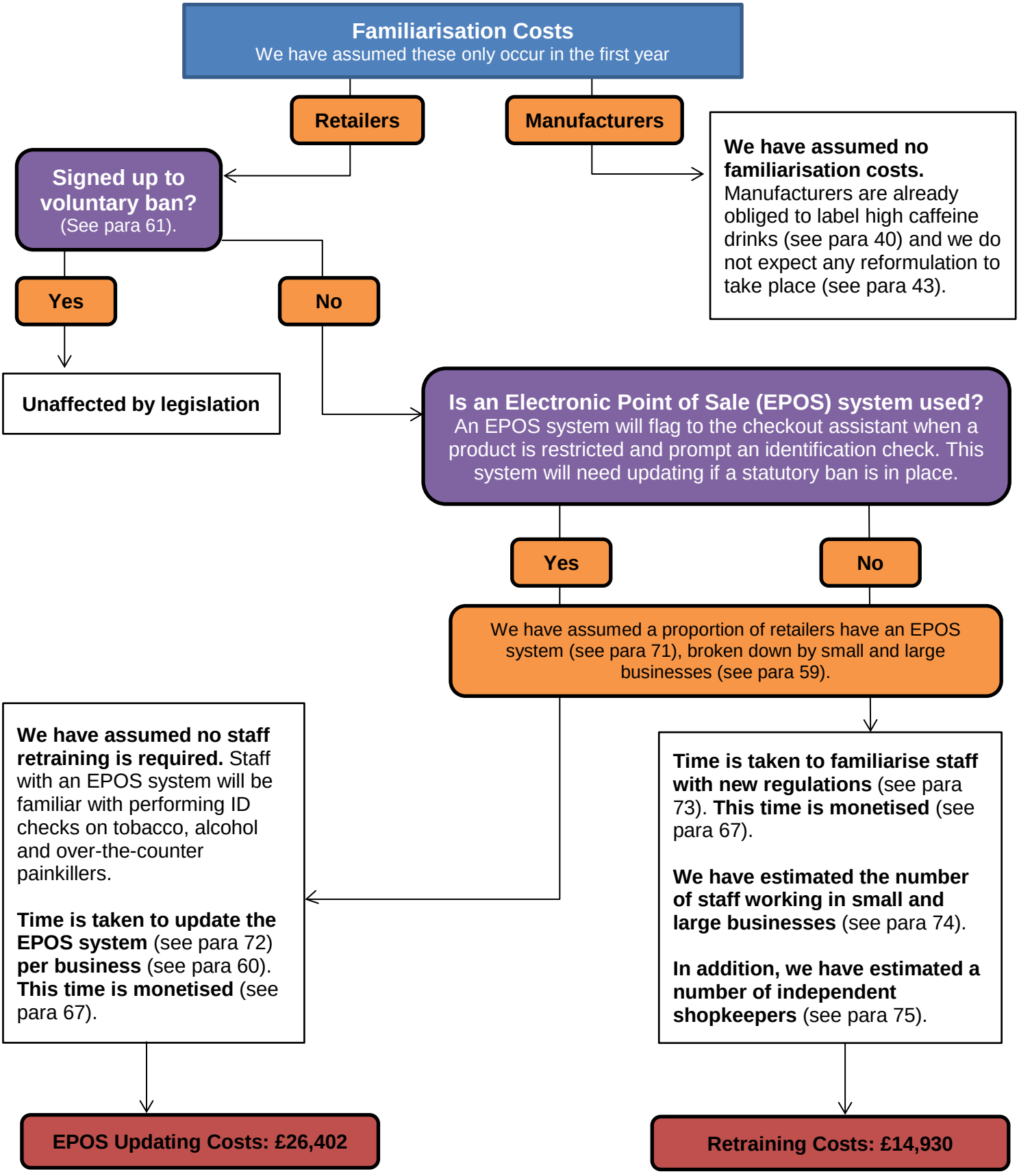
37. These assumptions reduce the net cost to business as the lost sales to the energy drinks industry are offset by benefits to those outside the energy drinks industry. Some of these benefits are direct benefits and others indirect (see para 91). Retailers only face a small proportion of the lost sales costs due to 90% being replaced with other soft drinks.

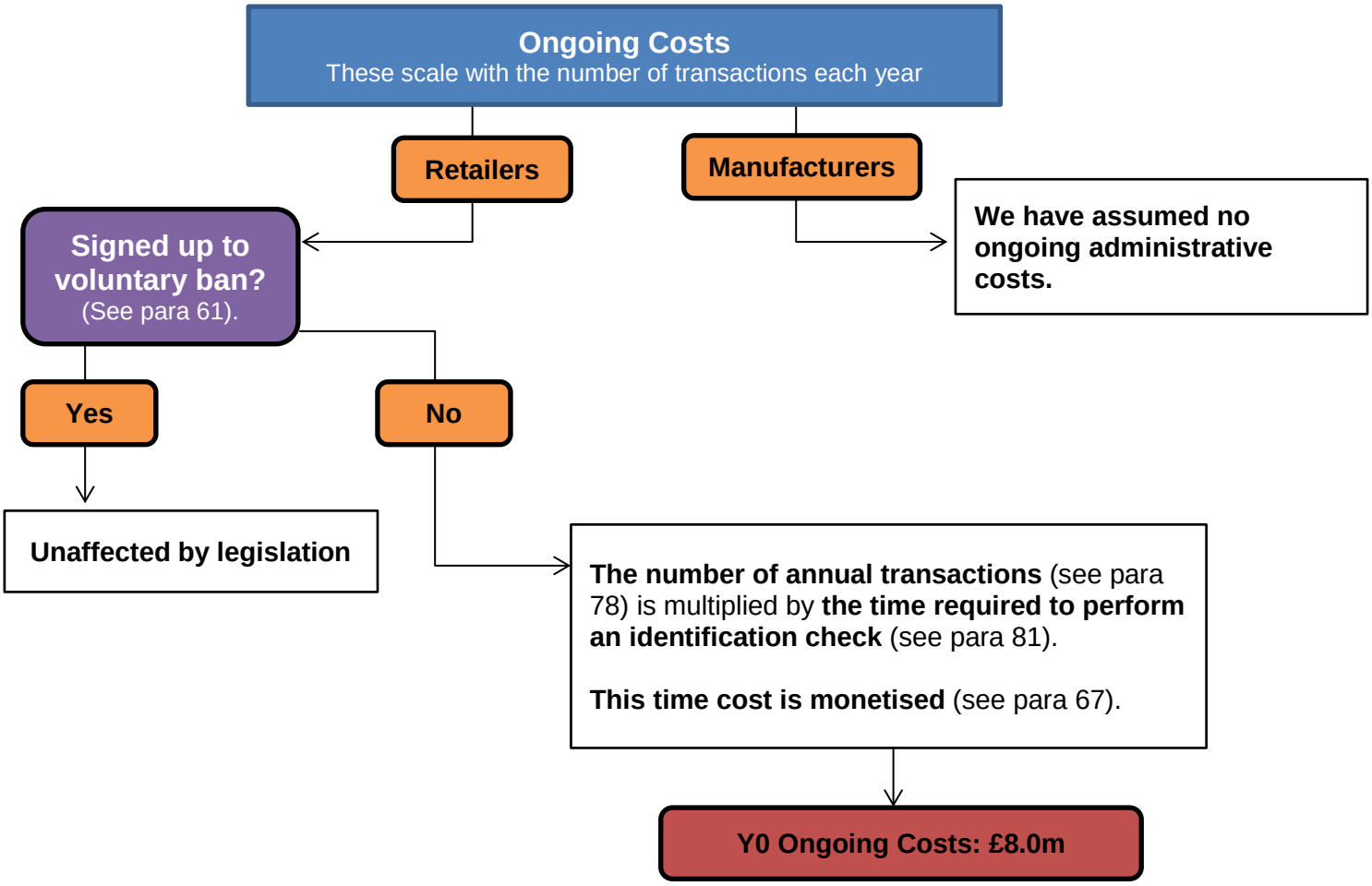
38. This means the main costs to business are administration costs. Indirect benefits are included in the net present value, but do not offset the Equivalised Annual Net Direct Costs to Business (EANDCB).

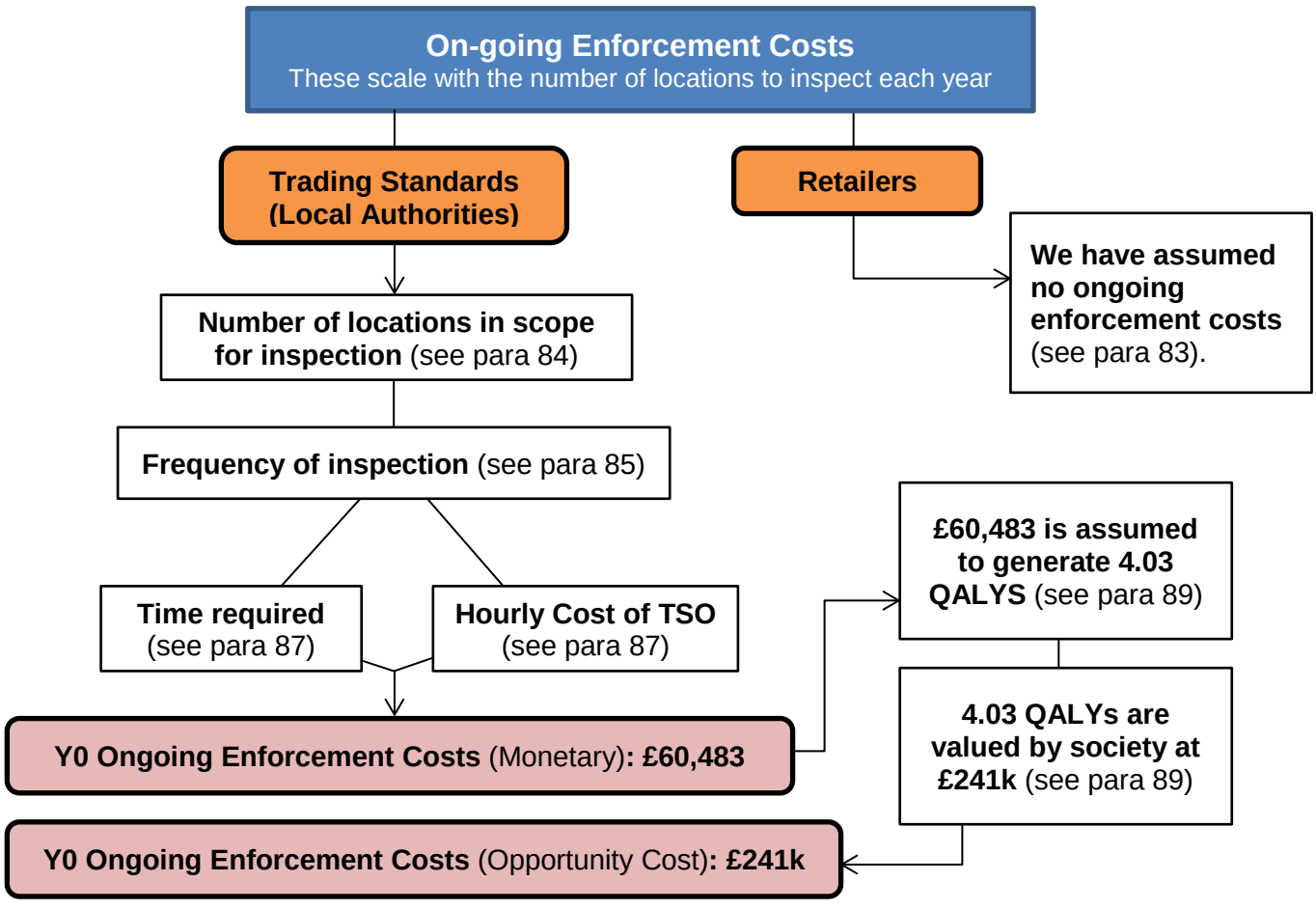
3.1 Costs:

39. We have identified two main categories of costs to business. These are **administrative costs** and **lost sales revenue**.

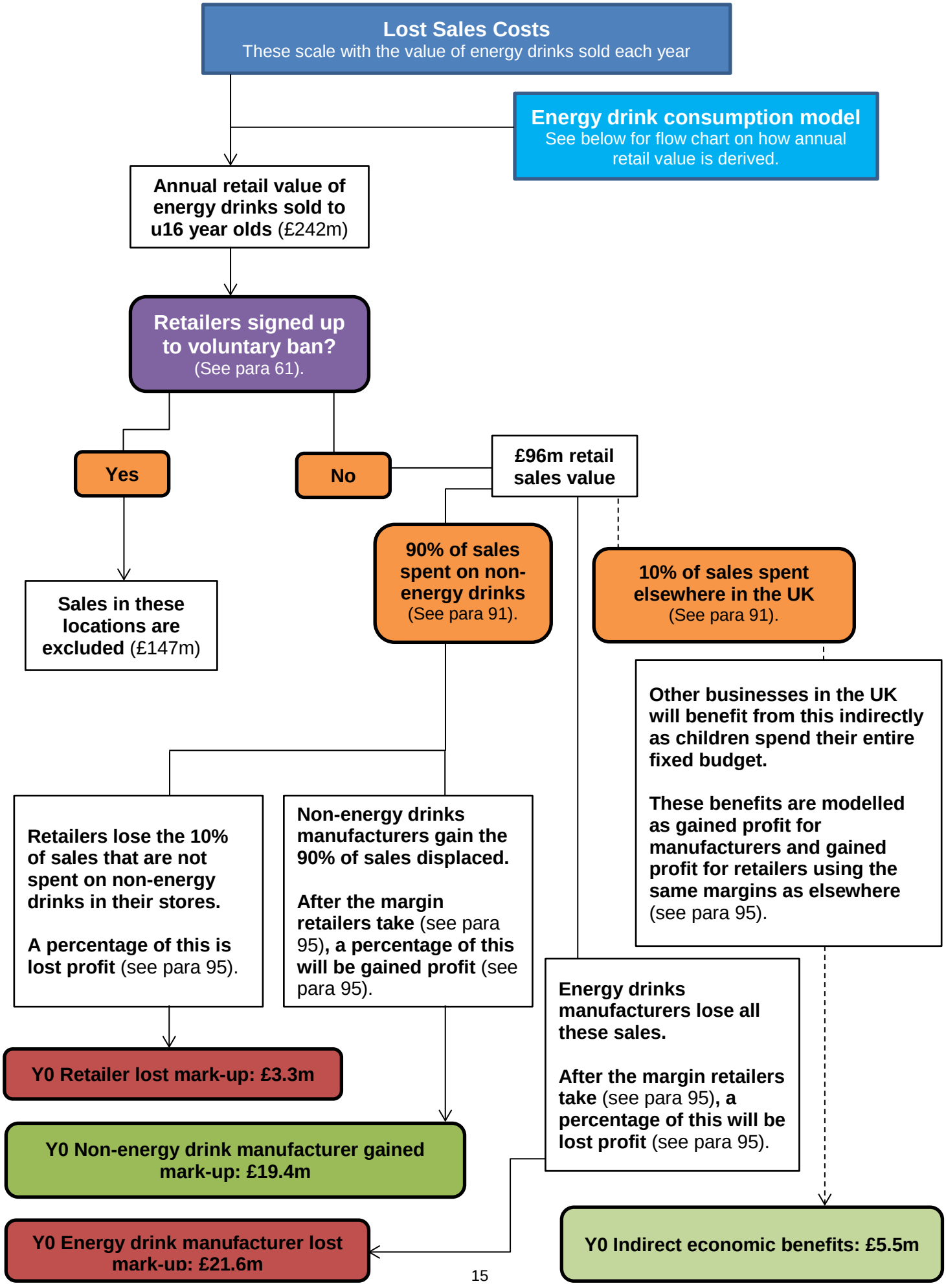
3.1.1 Administrative Costs:

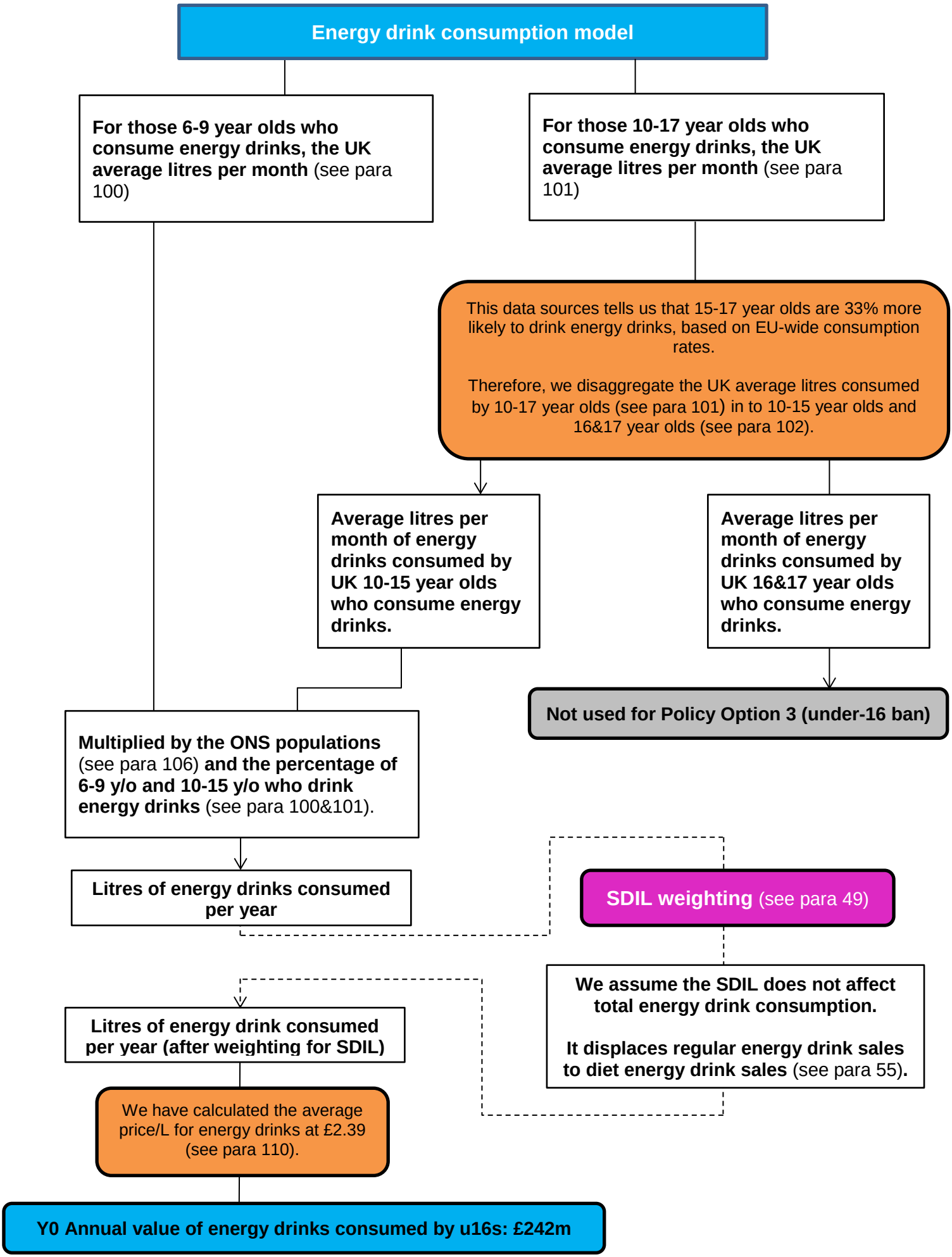



Ongoing Costs
These scale with the number of transactions each year
Retailers
Manufacturers
We have assumed no ongoing administrative costs.
Signed up to voluntary ban?
(See para 61).
Yes
No
Unaffected by legislation
The number of annual transactions (see para 78) is multiplied by the time required to perform an identification check (see para 81).
This time cost is monetised (see para 67).
Y0 Ongoing Costs: £8.0m


On-going Enforcement Costs
These scale with the number of locations to inspect each year
Trading Standards (Local Authorities)
Retailers
We have assumed no ongoing enforcement costs (see para 83).
Number of locations in scope for inspection (see para 84)
Frequency of inspection (see para 85)
Time required (see para 87)
Hourly Cost of TSO (see para 87)
£60,483 is assumed to generate 4.03 QALYS (see para 89)
4.03 QALYs are valued by society at £241k (see para 89)
Y0 Ongoing Enforcement Costs (Monetary): £60,483
Y0 Ongoing Enforcement Costs (Opportunity Cost): £241k

3.1.2 Lost Sales Costs:




Energy drink consumption model
For those 6-9 year olds who consume energy drinks, the UK average litres per month (see para 100)
For those 10-17 year olds who consume energy drinks, the UK average litres per month (see para 101)
This data sources tells us that 15-17 year olds are 33% more likely to drink energy drinks, based on EU-wide consumption rates.
Therefore, we disaggregate the UK average litres consumed by 10-17 year olds (see para 101) in to 10-15 year olds and 16&17 year olds (see para 102).
Average litres per month of energy drinks consumed by UK 10-15 year olds who consume energy drinks.
Average litres per month of energy drinks consumed by UK 16&17 year olds who consume energy drinks.
Not used for Policy Option 3 (under-16 ban)
Multiplied by the ONS populations (see para 106) and the percentage of 6-9 y/o and 10-15 y/o who drink energy drinks (see para 100&101).
Litres of energy drinks consumed per year
SDIL weighting (see para 49)
We assume the SDIL does not affect total energy drink consumption.
It displaces regular energy drink sales to diet energy drink sales (see para 55).
Litres of energy drink consumed per year (after weighting for SDIL)
We have calculated the average price/L for energy drinks at £2.39 (see para 110).
Y0 Annual value of energy drinks consumed by u16s: £242m

3.1.3 Assumptions (General):

Definition of Energy Drinks

40. Where possible, we have assumed that the ban on 'energy drinks' will apply to those drinks currently covered by EU Food Information Regulation (Regulation (EU) No. 1169/2011). This requires specifically labelling for drinks as unsuitable for children or pregnant or breast-feeding women if they contain over 150mg of caffeine per litre. This excludes drinks including the name 'coffee' or 'tea' and where caffeine is added for flavouring.

41. Whilst many energy drinks contain other stimulants and herbal extracts, caffeine is the only drink that is required to have its quantity stated on the packaging (when above 150mg/L). Due to data availability and for simplicity we have focused only on caffeine.

42. Our modelling does not attempt to match the definition of 'energy drinks' across data sources.

Reformulation

43. We have assumed manufacturers will not reformulate.

44. Our analysis of the UK energy drinks market[4] shows that for those drinks over the 150mg/L caffeine threshold, the average caffeine content is 311mg/L[5]. This average is weighted by market share and excludes supermarket own brand drinks as all major supermarkets have voluntarily agreed not to sell to under-16s.

45. Because the current average caffeine content is so much higher than the proposed sale threshold, we expect manufacturers to maintain their original recipes because the unique selling point of energy drinks is their stimulant properties.

Kantar Analysis

46. The dataset used for modelling the Soft Drinks Industry Levy and sugar and calorie reductions was a subset of Kantar Worldpanel 2017 data that had only included soft drinks.

47. The dataset only gives us sample data of households bringing energy drinks in to the home to consume. As the data excludes purchasing for consumption out-of-home it may not be representative of how energy drinks are typically consumed. Additionally, it does not provide figures specifically for under-16s. However, it is our only source of data on exactly what products are being purchased in the energy drinks market.

48. We compiled a list of 288 out of 5407 products that were deemed to be energy drinks based on the definition given in para 40. This list was manually compiled as caffeine data was not available in our Kantar data extract. We then excluded energy drinks that were supermarket branded as these are already off the market for under-16s under the voluntary ban. This gives us a bespoke cut of data looking only at energy drinks in the Kantar soft drink data.

Soft Drinks Industry Levy (SDIL)

49. The introduction of the SDIL in April 2018 is likely to increase the prices of high sugar energy drinks. This will affect our sales data. We have made an adjustment for the impact the SDIL will have on the consumption of sugar containing energy drinks and conclude a large amount of sugar containing energy drinks will still be consumed by children.

50. Not all energy drinks will be subject to the SDIL. Energy drinks below 5g of sugar per 100ml will have no levy, those with 5-8g of sugar per 100ml will have 18p/L levy and those with 8g or more of sugar will have 24p/L of levy applied to them.

[4] Data on the energy drinks market in the UK was taken from information on sales of the leading brands on the Statista website. Statista energy drinks data: https://www.statista.com/statistics/308493/leading-brands-of-energy-drinks-excluding-colas-or-mixers-for-alcoholic-drinks-in-the-uk/

[5] Information on the caffeine content of these drinks was taken from Caffeine Informer. Caffeine Informer website: www.caffeineinformer.com

51. ‘Regular’ and ‘diet’ are categories identified by Kantar from their product descriptions. Using the methodology outlined in para 47 we looked at sales data by litres of energy drink to identify the following results

Energy Drink SDIL Summary - by litres purchased		
	'Regular'	'Diet'
Market Share	74%	26%
Subject to 'High' >8g Sugar Levy	95%	0%
Subject to 'Med' 5≤g<8 Sugar Levy	2%	0.2%
Subject to 'None' <5g Sugar Levy	3%	99.8%
Source: DHSC Analysis of Kantar 2017 Data		

52. By multiplying the litres of energy drink consumed pre-SDIL weighting (see para 99), by the Kantar data derivations in para 51, we come to figure for the numbers of litres of energy drink subject to the high/medium/non ban.

53. 24/18/0p per litre price increases are added on to the average energy drink litre price (see para 110) to get the new price per litre for high/medium/non levy drinks. This gives us a 10/7/0% price increase for high/medium/non levy drinks.

54. HM Treasury estimated a price elasticity of demand of -1 for the SDIL modelling. We have assumed this holds for energy drinks. This means a 20% price increase would cause a 20% demand decrease.

55. By aggregating our high/med demand reductions and assuming they shift to diet energy drink sales we have new figures on the type of energy drink consumed to feed in to our benefits modelling.

56. We assume 100% of high/medium levy energy drinks are replaced with diet energy drink sales. We assume they have equal volume and retail value. This leaves the total litres consumed and retail sales value of all energy drinks unchanged as a result of the SDIL.

Number of Small and Large Retailers (Locations)

57. We considered the number of instances of convenience stores, supermarkets and other food retailers[6]. Forecourts and specialist retailers have been excluded here as we would not expect under-16s to shop here, although they would not be exempt from a ban.

58. We used the number of locations because classifying retailers by the value of retail sales would not represent the number of consumption opportunities. With energy drinks purchasing, we believe under-16s will purchase based on the number of shops they come across, regardless of their sales value size. In this case, it is more appropriate to compare the number of shops.

59. For analyses relating to classifying businesses as ‘small’ and ‘large’, a business has been defined as ‘large’ if the group has 100 locations or more.

60. By this measure, there are 50 ‘large’ businesses and 18,857 ‘small’ businesses with small businesses making up 36% of all locations.

Number of Retailers in the Voluntary Ban of Sales to under-16s

61. Where we have used the number of locations of stores (see para 57), we have then filtered the number of stores who have signed up to the voluntary ban. These are Tesco, Sainsbury’s, Waitrose, Asda, Morrisons, The Cooperative, Lidl and Aldi. These figures exclude non-grocery locations, such as Boots. This puts 21% of locations in the voluntary ban.

62. This is likely to be an under-estimate of those imposing a voluntary ban. Nisa and the Association of Convenience Stores (ACS) have provided guidance on banning the sale of energy to under-

[6] IGD - William Reed Business Media - Grocery Retail Structure 2017

16s to their members; however the decision remains with the shopkeeper. Additionally, some shopkeepers may have local arrangements with schools or parents.

63. We have assumed 50% of businesses not on the above 'ban list' also impose a voluntary ban. The ACS, who represents approximately 70% of convenience stores with 33,500 members, conducted a survey in January 2018 of 1213 of its members from independent and symbol group retailers (such as Nisa). 53% do not sell energy drinks to under-16s.

England Weighting

64. Figures were calculated on a UK wide basis due to data availability. As this policy is being consulted for England only, the figures have been adjusted to account for this.

65. All monetary figures have been multiplied by 84.2% to adjust from UK to England only. This is based on ONS Population Estimates (Mid-2016) that say England makes up 84.2% of the United Kingdom's population. These figures are for the entire population, not the child specific population.

66. Estimated calorie reductions are calculated per child based on the UK child population. These have not been adjusted for England only. Since they are per child, the figure would only be slightly different. Additionally, these calorie benefits are not monetised so there is no effect on the net present value.

3.1.4 Assumptions (Costs):

Valuation of Time:

67. We have valued the time of staff at £11.02 per hour.

68. The median hourly wage (including overtime) of 'Retail cashiers and check-out operators' in the UK is £8.48 according to the ONS Annual Survey of Hours and Earnings (ASHE)[7].

69. We have added 30% on top of this to account for non-wage employment on-costs such as pension contributions and National Insurance Contributions.

70. This time valuation remains the same for independent shopkeepers and for staff who will update Electronic Point of Sale (EPOS) systems.

Familiarisation Costs

71. We have assumed 100% of large businesses have an Electronic Point of Sale (EPOS) system in place. We have assumed 30% of small businesses have an EPOS system in place. Both these assumptions are unsupported.

1) Are there any further data sources on the number of small businesses that use an Electronic Point of Sale (EPOS) system?

See Annex D for further information on consultation questions.

72. It is assumed that it will on average take businesses 1 hour to update an EPOS system. This is unsupported.

73. In the absence of an EPOS system, we have assumed staff will need time to familiarise themselves with products under restriction. This has been assumed to take 0.2 of an hour (12 minutes), this assumption is unsupported.

2) Would it take 1 hour to update an Electronic Point of Sale (EPOS) system, or 12 minutes to show a staff member the black 'High Caffeine Content' warning label that is already printed on all drinks containing over 150mg/L of caffeine?

See Annex D for further information on consultation questions.

[7] SOC10-7112 Table 14.5a ASHE Provisional 2017, ONS (2017): https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/occupation4digitsoc2010ashetable14

74. The number of staff in small and large businesses has been calculated by combining ONS ASHE data[7] and ONS Business and Industry Tables[8]. ASHE data gives us the total number of people employed as 'Retail cashiers and check-out operators' in the UK at 133,000. The ONS Business and Industry Tables show us that non-specialised food stores make up 37.5% of all retailing by value of retail sales. 34.4% and 3.1% are for large and small businesses respectively, multiplying these percentages by 133,000 gives us an estimate of the number of staff in scope for retraining. We believe value of retail sales is a better measure than the number of locations in this instance, because larger retail sales will require larger stores and higher staffing levels.

75. We have assumed there are 18,841 independent shopkeepers who will not be classified in the ONS ASHE data for retail cashiers and check-out operators. This is based on the number of unaffiliated independent convenience stores according to the IGD Grocery Retail Structure[4].

76. Retraining time for staff in scope (outlined in paras 74 & 75) only applies to those businesses without an EPOS system.

Ongoing Costs

77. If a legislative ban were imposed, time would be required to check age identification. We have assumed this will operate similarly to 'Challenge 25' meaning all transactions to people under the age of 25 would be subject to age verification.

78. The annual number of energy drinks purchased is derived from the litres of energy drink consumed (see para 106) divided by the average banned energy drink size (see para 109). Only transactions passing through businesses not participating in the voluntary ban are counted (see para 61).

79. Para 78 outlines how we calculate the number of energy drinks purchased. To convert this in to the number of transactions we have assumed 1.7 average size energy drinks are purchased per transaction. This is unsupported.

80. The energy drink consumption data is for 6-17 year olds (see para 99). The source we have used only contains data for this age range only. We expect that in reality the majority of identity checks will be on 16-25 year olds under the 'Challenge 25' rules. This is a small administrative cost that does not have a large impact on the total policy costs. Due to lack of data available on the number of transactions we have used transaction data for 6-17 year olds to represent all transactions that will require an ID check.

81. It is assumed on average it will take 30 seconds to check identification. This is unsupported.

3) On average, does it take 30 seconds to check identification?

See Annex D for further information on consultation questions.

Enforcement Costs

82. Enforcement of the ban will be an on-going cost to Local Authorities. We have assumed there are no familiarisation costs for Local Authorities, Trading Standards Officers, or businesses, as all parties will be familiar with enforcement on the sale of alcohol, tobacco, lottery tickets and other age-restricted products. We expect the enforcement on energy drink sales will operate in a similar way.

83. We have assumed no on-going costs of enforcement to retailers. Whilst enforcement specifics may vary by Local Authority, we expect operations to be typically covert[9], resulting in a negligible impact to retailers.

[8] Table 4A - Retail Sales Index, ONS (2018): https://www.ons.gov.uk/businessindustryandtrade/retailindustry/datasets/retailsalesindexreferencetables

[9] http://www.tradingstandardswales.org.uk/help/underage.cfm

84. The derivation for the number of locations is detailed above (see para 57). This only looks at convenience stores, supermarkets and other food retailers. This will exclude other locations that may sell energy drinks such as pharmacists and petrol forecourts. Under this assumption there will be 52,688 locations in scope for inspection.

85. We do not have a direct estimate for the frequency of inspection. It is likely to vary by Local Authority. Information from the Welsh Trading Standards suggests food standards inspections are carried out every 2-5 years[10]. Therefore, we have assumed that on average of all locations, there will be an inspection frequency of once every 3.5 years.

4) On average, are retailers inspected for compliance every 3.5 years?

See Annex D for further information on consultation questions.

86. As retailers will likely require inspection for alcohol and tobacco compliancy, we have estimated that only a small amount of additional time will be added by a ban on the sale of energy drinks to under-16s. This has been assumed to be 10 minutes, however this is unsupported.

87. The hourly cost of a Trading Standards Officer (TSO) has been estimated at £28.63. According to Wandsworth Trading Standards Service and West Yorkshire Joint Services an experienced TSO would carry out routine checks. According to the National Career Service the average salary of an experienced TSO[11] is £24,000-50,000p/a. This has been converted in to an hourly salary by taking a mid-point of these salaries assuming a 37-hour working week, 5 weeks holiday and 8 days bank holidays. This is uplifted by an additional 30% to account for employer on-costs, including pension and National Insurance Contributions.

88. It is proposed that he Department of Health and Social Care will reimburse Local Authorities for the cost of enforcing this policy and would budget accordingly. Where a policy places an additional cost on the Department, it is DHSC policy to consider the opportunity cost of the spending, as this is a displacement from the fixed health budget.

89. At the margin, it is estimated that the NHS can purchase a Quality Adjusted Life Year (QALY) for £15,000. It is also estimated that a QALY is valued at £60,000 by society. The enforcement costs are divided by £15,000 to calculate the number of QALYs this spending will displace. Once we know the number of QALYs displaced, we can multiply this by £60,000 to estimate the societal value lost by covering these enforcement costs from the fixed health budget.

90. This means the opportunity costs of enforcement in the net present value are four times higher than the estimated monetary costs that DHSC will reimburse Local Authorities with.

Displaced Sales

91. If under-16s are no longer able to purchase energy drinks, we have assumed many of them will choose to purchase something else at the same retailer.

92. We have assumed 90% of lost energy drink sales will be displaced with other sales at the same retailer and that these sales will be of equal retail value.

93. In order to model the benefits, we have assumed that regular energy drinks will be replaced with regular soft drinks and that diet energy drinks will be replaced with diet soft drinks. We have assumed they will be of equal volume.

94. This means 90% of sales are displaced from energy drinks to other soft drinks. We believe under-16s will spend their entire energy drinks budget meaning the remaining 10% will be spent elsewhere in the UK economy. Consequently, the remaining 10% will appear as an indirect benefit to other businesses.

5) Are there any data sources to suggest what children are likely to do with their fixed energy drinks budget should they be banned?

See Annex D for further information on consultation questions.

Lost Mark-up

95. UK supermarkets have a mark-up of between 30-75%[12]. Due to the commercial sensitivity of profit data we do not have any more precise estimates for this.

96. A central average of 53% mark-up has been used for retailers, energy drink manufacturers, non-energy drinks manufacturers and other businesses.

97. Mark-up is the percentage of the cost price added on top to come to final retail sales price. A 53% mark-up is equivalent to roughly 35% margin. We can consider lost mark-up as the equivalent to lost 'marginal profit'. This is profit foregone through one lost sale, assuming all fixed costs remain the same.

98. When looking at mark-up between supplier and retailer, we have assumed there are no transportation, administration or distribution costs. This will overstate the lost revenue to energy drink manufacturers.

6) Is further information on the profit margins of retailers and manufacturers available?

See Annex D for further information on consultation questions.

Energy Drink Consumption

99. All the below energy drink consumption data comes from a single source. In 2013, the European Food Safety Authority (EFSA) published a comprehensive review in to energy drinks in children, adolescents and adults across the EU[13].

100. For children who were energy drink consumers, it reported EU children (6-9 year olds) consumed 2.1 litres of energy drink a month. Consumption figures for UK only children are not available due to small sample sizes in this age group. 24% of 6-9 year olds in the UK were energy drink consumers.

101. It reported further that UK adolescents (10-17 year olds) consumed 3.1 litres of energy drink a month, but only where children were energy drink consumers. 69% of 10-17 year olds in the UK were energy drink consumers.

102. For the purposes of modelling policy options 2 and 3, we wanted to separately model under-16s and 16 & 17 year olds. The EFSA report states that 55% of 10-14 year olds and 73% of 15-17 year olds consume energy drinks EU wide.

103. This means we know 15-17 year olds are 1.33 times more likely to drink energy drinks than 10-14 year olds.

104. If 3.1 litres per month is the population weighted average energy drink consumption of 10-17 year olds, we can disaggregate this. We know 15-17 year olds make up 38% of the UK population. With the probabilities of energy drink consumption outlined in para 102 and the population weightings here, we can derive the average litres of energy drink consumed is 2.76 litres for 10-14 year olds and 3.66 litres for 15-17 year olds.

105. For modelling purposes, we have assumed the 10-14 figures cover the 10-15 group, and 15-17 figures cover 16 & 17 year olds. This allows us to separately model a ban to under-16s and under-18s.

[12] United Kingdom Retail Foods, USDA FAS (2011): https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Retail%20Foods_London_United%20Kingdom_2-3-2011.pdf

[13] Zucconi, S., Volpato, C., Adinolfi, F., Gandini, E., Gentile, E., Loi, A., & Fioriti, L. (2013). Gathering consumption data on specific consumer groups of energy drinks. *EFSA Supporting Publications*, *10*(3).

106. We then use UK ONS 2016 mid-year population estimates[14] to obtain the following grid of litres of energy drink consumed every month.

Energy Drink Consumption Calculation Summary				
Age	**Proportion drinking energy drinks (UK)**	**Litres drunk - by those who drink energy drinks**	**ONS UK Population (16)[9]**	**Litres of energy drink per month**
6	24%	2.1 (EU)	812,484	415,464
7	24%	2.1 (EU)	803,811	411,029
8	24%	2.1 (EU)	809,767	414,074
9	24%	2.1 (EU)	782,793	400,281
10	69%	2.76 (d)	766,430	1,458,883
11	69%	2.76 (d)	736,871	1,402,618
12	69%	2.76 (d)	724,466	1,379,005
13	69%	2.76 (d)	703,991	1,340,031
14	69%	2.76 (d)	693,304	1,319,689
15	69%	2.76 (d)	713,265	1,357,684
16	69%	3.66 (d)	732,627	1,850,934
17	69%	3.66 (d)	757,787	1,914,499
(EU) - where figures are given by EU wide only due to small sample size (see para 100)				
(d) - derivations as outlined in paras 102 & 104				

Price and Size of Energy Drinks

107. The average size of energy drinks was collated from data on the UK energy drinks market[4] and Caffeine Informer[5].

108. We excluded drinks with less than 150mg/L and supermarket own-brand drinks as these are already off the market for under-16s due to the voluntary bans.

109. Caffeine Informer and MySupermarket data gave us the typical can size; although many drinks are available in multiple sizes and the can size was not sales weighted. We calculated a sales-weighted average of the typical can size based on the market shares provided by the UK energy drinks market data. The average can size is 0.36L.

110. MySupermarket was used to obtain the price of the typical can size. The average price was sales-weighted in the same way as for the typical size. The average price per litre is £2.39.

3.1.5 Growth over the Appraisal Cycle

111. Growth rates are calculated identically for either the 10 year appraisal cycle in the summary, or the 25 year appraisal cycle in Annex A.

112. Familiarisation costs are modelled to only apply in year one. We assume that there are no familiarisation costs after year one of the policy.

113. On-going administration costs are directly proportional to the number of transactions that require identification checks. If the energy drinks market for under-25s grows, so will the number of transactions requiring identification checks.

114. Following widespread media attention around energy drinks and other obesity policy measures, we have assumed a 0% growth in the volume of energy drink sales. Therefore, the number of transactions will only grow with the population in the counterfactual scenario. For this reason, we have assumed that transaction growth increases at the same rate as the 15-29 year old

[14] Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland, ONS (2018): https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland

population[15]. We assume all other costs (see para 77) remain fixed, meaning in base year prices the on-going administration costs increase at the rate of 15-29 year old population growth.

115. On-going enforcement costs are directly proportional to the number of locations that need to be inspected. We have assumed this does not grow over time. This means that in base year prices, there is no growth in on-going enforcement costs.

116. The value of lost sales is directly proportional to the counterfactual value of retail sales to under-16s. Following a high profile public campaign and widespread voluntary bans, we have assumed a 0% volume growth in energy drinks going forward per child in the counterfactual scenario. This means the total volume will vary with the population changes. We have used ONS 0-14 population growth estimates for this[15]. For the purposes of the impact assessment, retail sales value is kept in real terms. We assume that the average price of energy drinks rises at the same rate as general inflation. This means in real terms, the retail sales value grows at the same rate as the growth in volume.

117. Growth for gained sales to non-energy drink manufacturers and indirect economic benefits are modelled in the same way as the value of lost sales (para 116).

7) Are there any further data sources on the potential growth for the energy drinks market to children?

See Annex D for further information on consultation questions.

3.1.6 Small and Micro Businesses Assessment

Costs to Small and Micro Businesses

118. We assume no energy drinks manufacturers are micro businesses. Analysis of market data[4] shows 5.5% of energy drinks sales are from 'Other' manufacturers. There is no evidence to suggest these 'Other' manufacturers are small or micro businesses.

119. We expect the small and micro business impact to accrue from impacts to retailers. Impacts to retailers are limited due to small administration costs and many of the lost sales of energy drinks being replaced with other sales (see para 91).

120. The above figures on large/small retailer locations (see para 60) are an under-estimate of the number of small and micro businesses as classified by the Regulatory Policy Committee. Of the 50 'large' businesses classified above, some are businesses such as Nisa that are named marks of a collection of independent small and micro businesses.

121. Of the 42,316 convenience stores, only 5861 are owned by the biggest retailers that have publicly signed up to the voluntary ban on the sales of energy drinks (Tesco, Sainsbury's, Waitrose, Asda, Morrisons, The Cooperative, Lidl and Aldi).

122. Whilst not a direct comparison from the same dataset, Kantar Worldpanel data from March 2018 shows these eight retailers make up 93% of the grocery market by retail sales value[16].

123. This means we can assume a large number of the remaining 36,455 convenience stores will be small and micro business operating as franchises under names such as Nisa, Spar and Costcutter. 18,841 of these are unaffiliated independent convenience stores and likely to be classified as micro businesses.

124. Over the 10 year appraisal cycle, there is a net present value of lost mark-up to retailers of £28m. There are £49k of familiarisation costs and £68m of on-going administrative costs.

[15] Population Projections – UK Summary, ONS (2017): https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/tablea11principalprojectionuksummary

[16] GB Grocery Market Shares, Kantar Worldpanel (2018). Accessed: 25/04/2018 https://www.kantarworldpanel.com/en/grocery-market-share/great-britain/snapshot/25.03.18/

125. Calculating the exact impact that would fall on micro business is not possible due to a lack of information on the market structure and retailer size. However, given voluntary action is concentrated in larger businesses we can expect the majority of these costs to fall to small or micro businesses.

8) Are there any further data sources to help us understand the impact of the policy on small or micro businesses?

See Annex D for further information on consultation questions.

Exemption of Small and Micro Business

126. There are currently no plans to exclude small and micro businesses.

127. The majority of businesses that are not currently signed up to the voluntary ban on sales of energy drinks (see para 61) are likely to be small and micro businesses. Statutory action would be designed to compel the ban of sale of energy drinks to under-16s in businesses not already voluntarily doing so. This means that statutory action excluding small and micro business would undermine the policy objective. Whilst the primary policy objective is to prevent the consumption of energy drinks in under-16s, this can be approximated to the sale of energy drinks here.

3.1.7 Business Impact Target (BIT) Calculations

128. With the exception of enforcement costs, all costs modelled here are direct costs to business and in scope for the BIT.

129. Displaced sales to non-energy drinks manufacturers are a benefit to private business that accrues as a direct result of the policy. As such, it reduces the net cost to business per year and is in scope for the BIT.

130. Other gained sales represent an indirect benefit to the UK economy. These are in the net present value as a benefit, but are excluded from the BIT calculations.

3.2 Benefits:

131. **Caffeine and high sugar content are the two main concerns with energy drinks.** The areas for concern with energy drink consumption in under-16s are primarily caffeine (and other ingredients) consumption (see para 147) and secondarily the high sugar content (see para 179).

132. **Restriction of sales will accrue benefits through reduced caffeine and sugar consumption.**

3.2.1 Un-monetised Benefits and Breakeven Analysis

133. Due to the uncertainties of behavioural change beyond the age of 16 (see para 197) and long forecasting timescales, it is not possible to quantify the benefits from a reduced calorie intake. A breakeven analysis from calorie benefits alone is included in Annex B.

134. Our best available evidence on caffeine consumption (a European Food Safety Authority Report[20]) does not give quantified levels of harm for varying levels of caffeine consumption. Therefore we cannot model the health benefits of reduced caffeine consumption.

135. In addition to evidence we may receive as part of the consultation process, we have commissioned a comprehensive review of the current literature by the EPPI-Centre at UCL to ensure we have the best available evidence when reviewing the impacts at the final stage.

136. However, we do not expect the evidence base to improve with time due to study ethics likely preventing any randomised control trials on children. This means we expect the evidence to remain observational. Current observational trials are unable to establish specific levels of harm from varying levels of caffeine consumption.

137. Despite this, there are a number of identified possible health decrements from energy drink and caffeine consumption. These are discussed at length below.

138. 24% of 6-9 year olds and 69% of 10-17 year olds drink energy drinks (see para 100). The benefits would need to amount to £2.12 per energy drinking 6-15 year old per year (based on a 10 year average of net costs) for the policy to breakeven.

3.2.2 Summary of Benefits

139. **High, unintentional consumption is a risk.** Although defined ‘safe’ levels of energy drink and caffeine consumption in children cannot be fully established (see para 146), there is evidence to show children are unaware of what they are consuming (see para 152), however this is observed less as children age. This gives rise to the risk that caffeine will be consumed beyond intended levels.

140. Whilst evidence shows that on average across the surveyed population energy drinks make up a relatively small proportion of total dietary caffeine intake (see para 156); energy drink consumption may be concentrated in a sub-set of the surveyed population. This means for some children there may still be a significant risk of overconsumption.

141. **Energy drinks have been associated with headaches, anxiety, sleep disturbances and self-reported health complaints.** It is important to note, even in those studies that account for deprivation, because all studies are observational it is not possible to identify causality. There is strong evidence of associations between energy drink consumption and health decrements; however it is not possible to directly attribute these health decrements to energy drink consumption with certainty.

142. **Energy drink consumption is associated with deprivation and other unhealthy behaviours.** We know both of these factors have negative impacts on physical and mental health. This means when observing a correlation between energy drink consumption and health decrements it should be considered that energy drinks may only be a signal and may have no causal relationship where studies do not account for deprivation.

143. **There may be obesity benefits from the policy through a reduction in calories consumed.** Based on our modelling approach we expect a ban on the sale of energy drinks to reduce the calories consumed by under-16s. It has not been possible to monetise these benefits and has been discussed at length in para 179 onwards.

144. **Monetised benefits accrue from non-energy drink manufacturers gaining sales.** We have assumed a proportion of the money spent on energy drinks will be displaced to other sales if a ban were to be enforced (see para 91).

3.2.3 Consumption of Energy Drinks

Recommended Consumption Level

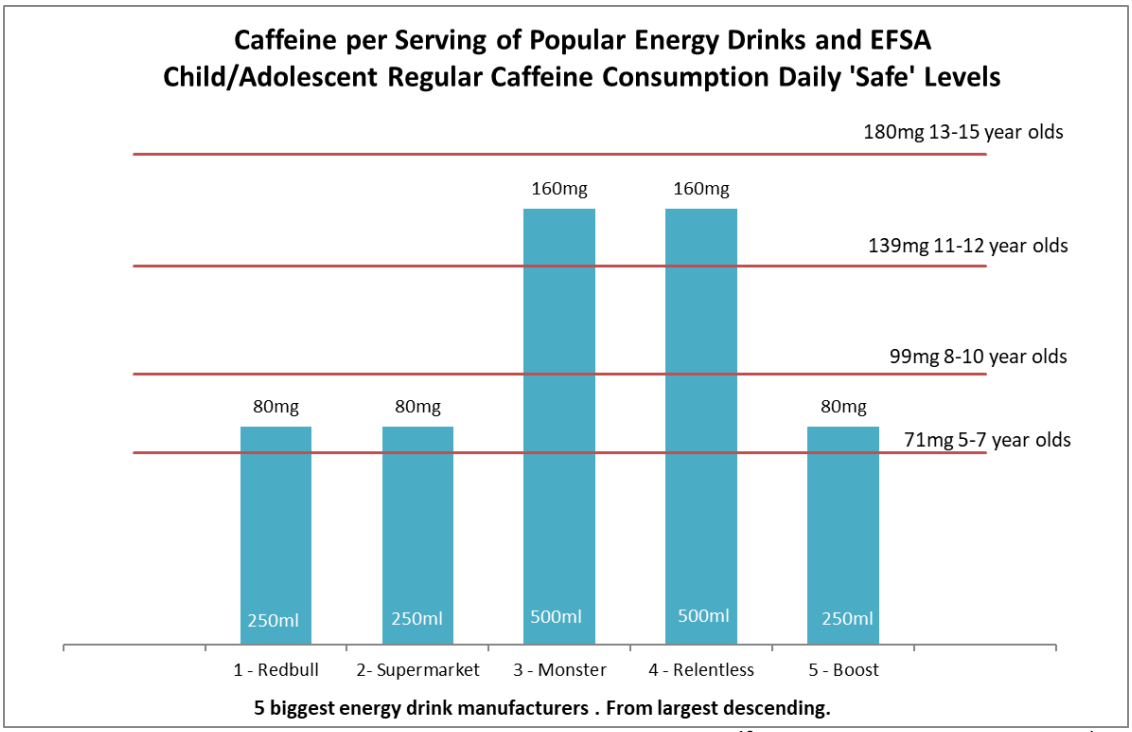
145. There is neither an explicit safe nor unsafe level of caffeine consumption in children published by the European Food Safety Authority (EFSA) or the UK Food Standards Agency. The ethics of conducting randomised control trials regarding caffeine consumption on children mean that we are unlikely to see this change.

146. The EFSA state consuming 3mg/kg of body weight/day does not give rise to any health concerns in adults or breastfeeding and pregnant women[17].

147. Additionally, the EFSA have said the levels deemed to be of no concern to adults may also be applied to children and adolescents based on the available evidence[18].

148. Below is an illustrative graph that maps the five largest energy drink brands against a 3mg/kg bw threshold. Average body weights are collected from the 2016 Health Survey for England[19].

149. This shows that a single large can of energy drink can exceed 3mg of caffeine/kg bw for 11-12 year olds and under. If multiple cans are consumed in one day, as one study suggests[21], these levels could quickly be exceeded. Additionally, most energy drinks are available in higher caffeine variants, with only the standard versions being mapped here.



Source: DHSC analysis of Health Survey for England publications[19] and energy drinks market data[4]

[17] Agostoni, C., Canani, R. B., Fairweather-Tait, S., Heinonen, M., Korhonen, H., La Vieille, S. & Nowicka, G. (2015). Scientific opinion on the safety of caffeine. *EFSA Journal*, *13*(5).

[18] EFSA NDA Panel (EFSA Panel on Dietetic Products, Nutrition and Allergies), 2015. Scientific Opinion on the safety of caffeine. EFSA Journal 2015;13(5):4102, 120 pp. doi:10.2903/j.efsa.2015.4102

[19] Health Survey for England 2016, NHS Digital. Accessed: 05/04/2018 https://digital.nhs.uk/catalogue/PUB30169

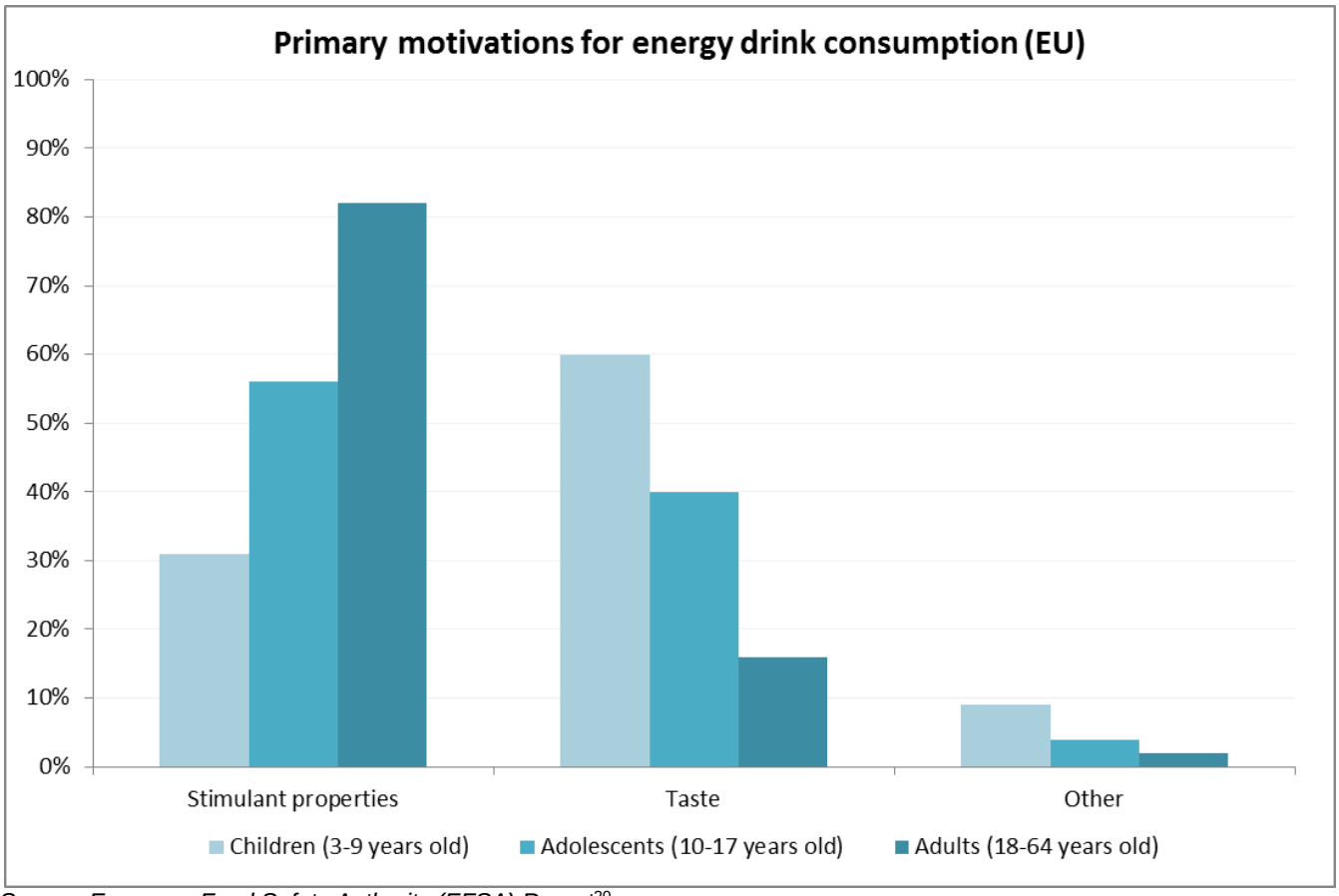
Energy Drink Consumption

150. **Evidence suggests some of the youngest children are unable to identify the difference between energy drinks and other soft drinks. Additionally they are typically not consumed for stimulation.** The below evidence suggests children may be consuming energy drinks without realising, or primarily for their taste rather than stimulant properties. This implies children may not be consuming energy drinks for their primary purpose meaning they are receiving health decrements as an unintended consequence.

151. This effect is concentrated amongst the 3-9 year old groups; however it is the 10-17 year olds who consume the most energy drinks. Despite this, 10-17 year olds still consume energy drinks for stimulation in lower levels than the adult population.

152. **Children may not be able to identify energy drinks.** Across the EU, 42% of 3-9 year olds were unable to distinguish between an energy drink and other soft drinks[20]. This information was not collected for the 10-17 year old or adult groups.

153. **Children and adolescents are drinking energy drinks for their taste, rather than stimulation.** In the same survey, the motivations for drinking energy drinks in 16 EU countries were recorded. The graph below shows that children and adolescents are more likely to consume energy drinks for taste rather than stimulation when compared to adults. Whilst over 50% of adolescents consume energy drinks for stimulation, this may be skewed by 16 and 17 year olds, the highest energy drink consumers (see para 102), who would be exempt from a ban in this policy option.



Source: European Food Safety Authority (EFSA) Report[20]

154. **Low cost is another key driver for energy drink consumption.** A small sample qualitative study found the low cost of some energy drinks is a key factor in 10-14 year olds decision to buy

[20] Zucconi, S., Volpato, C., Adinolfi, F., Gandini, E., Gentile, E., Loi, A., & Fioriti, L. (2013). Gathering consumption data on specific consumer groups of energy drinks. *EFSA Supporting Publications*, *10*(3).

an energy drink. They are available on promotion for as low as 4 250ml cans for £1. The study found this often makes them cheaper than other carbonated beverages[21].

155. **Adolescents in the UK consume over 50% more energy drinks than the EU average.** For those who consume energy drinks, the average UK adolescent (10-17 year old) consumes 3.1L/month, compared with an EU average of 2.0L/month[20]. This means any adverse effects may be amplified for UK under-16s.

156. **However, energy drinks are not the main contributor to caffeine in children and adolescents diets.** Caffeine is found in many foods and drinks. For those who consume energy drinks, 43% of dietary caffeine comes from energy drinks in 3-9 year olds, compared to 13% in 10-17 year olds[20]. The majority of the remaining caffeine comes from coffee, tea, chocolate and sodas. However, these figures are an average over the surveyed population; energy drink consumption may be concentrated in a sub-set of the surveyed population. This means for some children there may still be a significant risk of overconsumption.

3.2.4 Caffeine Consumption and Health

Health Concerns – Physical Health

157. **Energy drinks have been associated with headaches.** A Finnish study on adolescents aged 12-18 found those who consumed energy drinks several times a day were 4.5 times more likely to report experiencing headaches than non-users[22]. This study accounted for some demographic differences such as academic achievement, parental education and family structure.

158. **Energy drinks may be associated with health complaints.** Unpublished analysis of the WHO Health Behaviour in School Aged Children (HBSC) Survey commissioned by DHSC in 2015 found 70% of daily energy drinkers reported having two or more health complaints, this compared to 43% of those who never drank energy drinks. However, the effects of deprivation were not considered in this study[23].

Health Concerns – Mental Health

159. Energy drink consumption has been associated with depressive symptoms, emotional difficulties and lower well-being among children and adolescents[24]. Depressive symptoms were 11% higher and 'total difficulties' were 25% higher in those who consumed energy drinks 4+ times a week compared to those who never consumed energy drinks. This study accounted for age, gender, ethnicity, deprivation and household poverty.

160. The HBSC Survey found 55% of daily energy drink consumers rated their life satisfaction as high, compared to 84% of those who never drink energy drinks. Additionally, those consuming energy drinks daily are more likely to report low life satisfaction. However, the effects of deprivation were not considered in this study[23].

161. A systematic review of caffeinated drink consumption in children concludes high caffeine intake (>5mg/kg bw) increases the risk of anxiety and withdrawal symptoms[25].

Health Concerns - Sleep

162. **Caffeine consumption increases sleep disturbances and has been associated with insomnia[26]**. The European Food Safety Authority (EFSA) reported doses of 1.4mg/kg of body

[21] Visram, S., Crossley, S. J., Cheetham, M., & Lake, A. (2017). Children and young people's perceptions of energy drinks: A qualitative study. *PloS one*, *12*(11).
[22] Huhtinen, H., Lindfors, P., & Rimpelä, A. (2013). Adolescents' use of energy drinks and caffeine induced health complaints in Finland: Arja Rimpelä. *The European Journal of Public Health*, *23*(1), 123-050.
[23] Brooks, F., Klemera, E., & Magnussen, J. (2015). *Young People and Energy Drink Consumption: Findings from the WHO Health Behaviour in School Aged Children Survey (HBSC).* Unpublished manuscript.
[24] Utter, J., Denny, S., Teevale, T., & Sheridan, J. (2017). Energy drink consumption among New Zealand adolescents: associations with mental health, health risk behaviours and body size. *Journal of paediatrics and child health*, *54*(3), 279-283.
[25] Ruxton, C. H. S. (2014). The suitability of caffeinated drinks for children: a systematic review of randomised controlled trials, observational studies and expert panel guidelines. *Journal of human nutrition and dietetics*, *27*(4), 342-357
[26] Burrows, T., Pursey, K., Neve, M., & Stanwell, P. (2013). What are the health implications associated with the consumption of energy drinks? A systematic review. *Nutrition reviews*, *71*(3), 135-148.

weight (less than half the 'safe' threshold in para 147) may increase sleep latency and reduce sleep duration in some children and adolescents. The scale of the effect is not specified[27].

163. **Energy drink consumption has been linked to sleeping problems.** The Finnish study mentioned in para 157 reported 12-18 year olds consuming energy drinks were; 3.5 times more likely to report sleeping problems, 3.4 times more likely to report experiencing tiredness and significantly more likely to report late bedtimes when compared to non-users[22]. This study accounted for some demographic differences such as academic achievement, parental education and family structure.

164. **Energy drink consumption may reduce the ability to concentrate at school due to lack of sleep.** The HBSC study mentioned in para 158 found that 34% of adolescents who consumed energy drinks reported a lack of sleep affected their ability to concentrate at school. This compares to 18% for non-energy drink users[23]. This survey does not account for the relationship between energy drink consumption and deprivation.

Energy Drinks and School Behaviour

165. In spite of anecdotal evidence of energy drink consumption affecting behaviour in schools, our initial literature review has returned no robust evidence on this.

166. However, in a recent survey by the NASUWT teaching union, it was found that when given a choice of 23 potential causes of pupil indiscipline, 13% of teachers and school leaders identified energy drinks as a key cause of the poor behaviour they have witnessed[28].

167. We expect to strengthen our knowledge in this area through the review by EPPI-Centre and the consultation process.

Energy Drinks, Deprivation and Other Unhealthy Behaviours

168. There is evidence linking energy drinks to deprivation and other unhealthy behaviours. We know both of these factors have negative impacts on physical and mental health. This means when observing a correlation between energy drink consumption and health decrements it should be considered that energy drinks may only be a signal and may have no causal relationship where studies do not account for deprivation.

169. **Energy drink consumption is associated with deprivation.** Unpublished analysis of the WHO Health Behaviour in School Aged Children (HBSC) Survey commissioned by DHSC in 2015 showed that energy drink consumption was higher in those who received free school meals (FSM) in the UK. For those who never drink energy drinks, or drink less than once a week, 11% receive FSM. Amongst those who regularly consume energy drinks FSM receipt is 16%. For those who drink energy drinks daily, or more than once a day, 23% receive FSM.

170. A study in New Zealand observed that energy drink consumption was more common in people with low socioeconomic status[24].

171. **Energy drink consumption is associated with other unhealthy behaviours.** The same study in New Zealand found frequent energy drink consumption was strongly associated with binge drinking, smoking, violent behaviour and risky motor vehicle use[24]. It is highly unlikely energy drinks cause these behaviours.

[27] Agostoni, C., Canani, R. B., Fairweather-Tait, S., Heinonen, M., Korhonen, H., La Vieille, S., ... & Nowicka, G. (2015). Scientific opinion on the safety of caffeine. *EFSA Journal*, *13*(5).

[28] NASUWT Big Question Survey 2017. Accessed 18/07/18: https://www.nasuwt.org.uk/article-listing/nasuwt-victory-on-energy-drinks-ban.html

Number of times more likely to exhibit behaviour compared to non-users		
	Energy drink consumption in the last 7 days	
	1-3 times	4+ times
Risky motor vehicle use	2.3	3.5
Violent behaviour	2.0	3.5
Unsafe sex	1.6	2.2
Alcohol binge behaviour	2.4	3.7
Regular smoking	2.5	4.7
Disordered eating	1.4	1.7

3.2.5 Other Ingredients in Energy Drinks

172. Caffeine is the main stimulant found in energy drinks. Often caffeine containing herbal extracts are found in energy drinks, but these do not have to be labelled on the packaging. This means that total caffeine content may be higher than the stated added caffeine content on the packet.

173. Caffeine containing herbal extracts include: guarana, kola nut, tea, yerba mate and cocoa[29].

174. Taurine is another added ingredient commonly found in energy drinks with claimed stimulant properties.

175. The European Food Safety Authority (EFSA) found taurine and guarana are not harmful to health in the quantities found in energy drinks[17].

3.2.6 Caffeine, Sugar and Other Ingredient Interactions

176. In energy drinks, caffeine is often consumed in combination with a range of other ingredients (see para 172). Additionally, except for diet energy drinks they are usually consumed with high amounts of sugar.

177. **Taurine was not found to be harmful when consumed with caffeine in the levels found in energy drinks according to the European Food Safety Authority**[17]. Other ingredients have not been assessed in combination with caffeine.

178. **Caffeine may increase the appetite for sugar.** A randomised control trial gave 18-30 year olds caffeinated and non-caffeinated sugar sweetened beverages (SSBs) that were controlled for taste by a trained flavour panel. Participants drinking the caffeinated SSBs preferred its taste and consumed 53% more[30] (419ml/day for caffeinated and 273ml/day for non-caffeinated). It was suggested this was because caffeine acts on parts of the brain that mediate reward and addiction, increasing the liking and consumption of sugar.

[29] Haskell, C. F., Kennedy, D. O., Wesnes, K. A., Milne, A. L., & Scholey, A. B. (2007). A double-blind, placebo-controlled, multi-dose evaluation of the acute behavioural effects of guaraná in humans. *Journal of Psychopharmacology*, *21*(1), 65-70

[30] Keast, R. S., Swinburn, B. A., Sayompark, D., Whitelock, S., & Riddell, L. J. (2015). Caffeine increases sugar-sweetened beverage consumption in a free-living population: a randomised controlled trial. *British Journal of Nutrition*, *113*(2), 366-371.

3.2.7 Reduced Calorie and Sugar Benefits:

179. Energy drinks are typically higher in sugar than other soft drink alternatives (see para 191). This means a ban on them would likely remove sugar (and calories) from under-16's diets.

180. A ban would have two main health benefits, a reduction in obesity and a reduction in dental cavities. However, neither are included in the net present value (see para 182).

Obesity Reduction

181. DHSC analysis has shown the potential calorie reductions as follows (see para 190):

	Daily Calorie Reductions per Child	Total yearly calorie reductions
6-9 year olds	2.3	2695m
10-15 year olds	8.6	13561m
16&17 year olds	11.4	6183m

Note: The total yearly calorie reduction is for the entire UK.

182. As outlined in para 197, this policy is only designed to prevent the consumption of energy drinks to under-16s. There is no evidence available to allow us to estimate how this policy would affect the energy drink consumption as children subject to the ban become adults.

183. The DHSC Calorie Model, used to quantify benefits from policies reducing calorie intakes, currently only accounts for benefits accruing to adults. Therefore, it cannot be used to monetise the benefits of reduced calorie intake by children alone, as has been modelled here.

184. We have made an illustrative model of potential calorie benefits in Annex B.

185. In addition, lower BMI in overweight and obese children is likely to have a range of benefits from increased ability to participate in physical activity to greater self-esteem, health and wellbeing.

Dental Cavity Reduction

186. A reduction in sugar has been shown to cause a reduction in dental cavities. Public Health England has modelled this based on research[31].

187. A reduction in cavities would reduce the number of fillings, extractions and hospital admissions required, which is of particular detriment to those children who have their adult teeth.

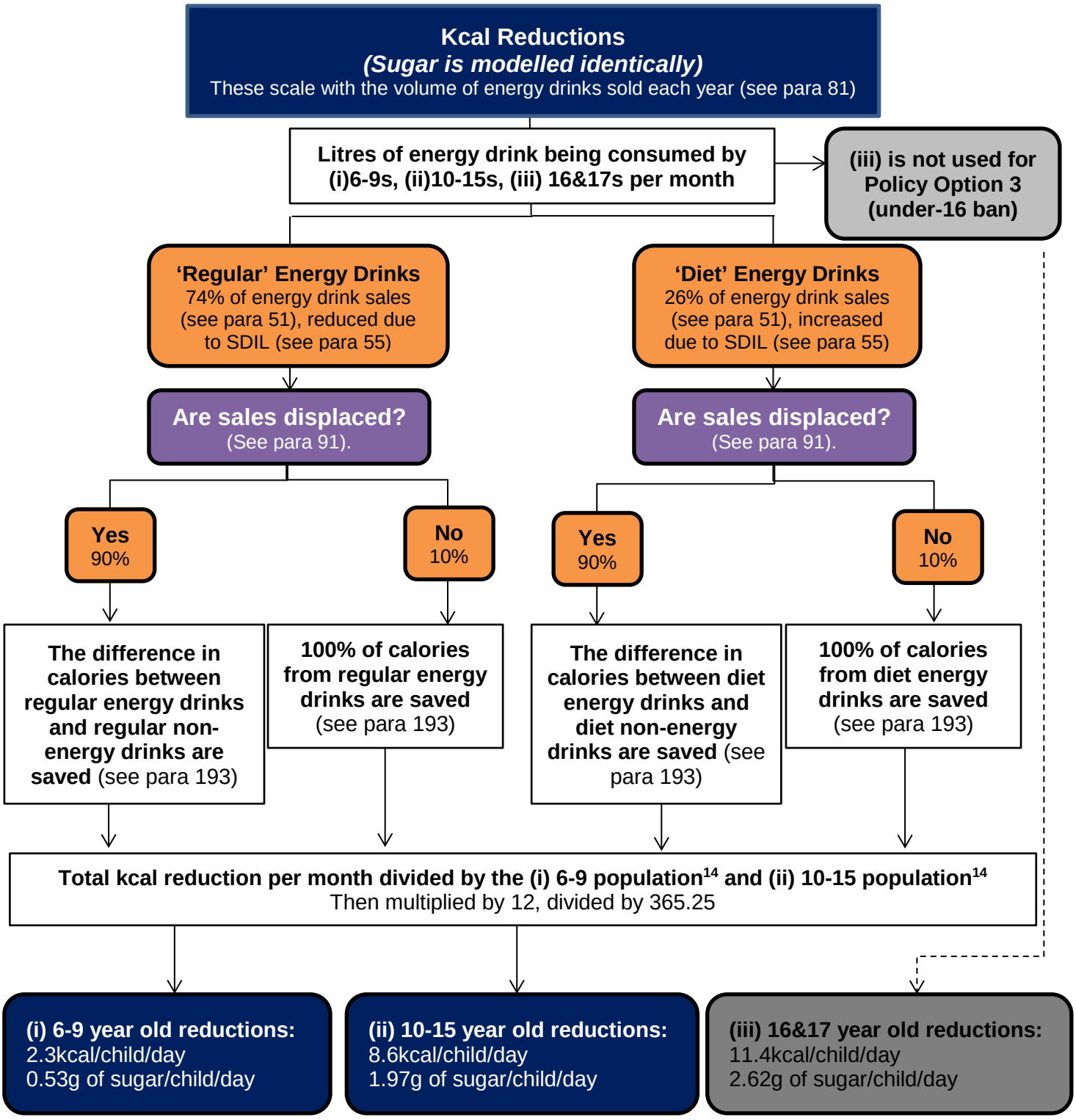
188. This benefit has not been monetised as there are large uncertainties in the marginal effects of sugar on dental cavity incidences and the full costs of a cavity.

189. However, we expect these benefits may be significant. In 2018, the British Dental Association said that tooth decay is the most common reason for child hospital admission[32].

[31] Jamel, H., Plasschaert, A. and Sheiham, A. (2004), Dental caries experience and availability of sugars in Iraqi children before and after the United Nations sanctions. International Dental Journal, 54: 21-25. doi:10.1111/j.1875-595X.2004.tb00248.x

[32] British Dental Association (2018) Child decay stats badge of dishonour for ministers, say dentists, press release. Accessed:16/07/2018: https://www.bda.org/news-centre/press-releases/Child-decay-stats-badge-of-dishonour-for-ministers

190. We have modelled the calories and sugar removed as outlined below:



Assumptions (kcal and grams of sugar reduced):

191. Using the methodology outlined in paras 47 & 48 we filtered 2017 Kantar soft drink sales data to provide us with a list of energy and non-energy soft drinks.

192. Both energy and non-energy drinks were split into the categories 'Regular' and 'Diet' as classified by Kantar.

193. Kantar data lists both kcal grams of sugar per 100ml. We take a volume of sales weighted average to get the kcal/g of sugar per litre for regular energy drinks (454/107), regular non-energy soft drinks (284/65), diet energy drinks (33/1) and diet non-energy soft drinks (11/1).

3.2.8 Non-Energy Drink Manufacturer's Gained Sales

194. As outlined in the '3.1.2 Lost Sales Costs' flow chart, many of the sales lost by energy drink manufacturers will be offset by gains to non-energy drink manufacturers.

195. Some brands such as Red Bull are owned separately, however many energy drink brands are owned by bigger manufacturers with diverse portfolios. Relentless are owned by The Coca Cola Company. Coca Cola has a small stake in Monster Beverage Company and has granted Monster the rights to its energy drink brands. Pepsi Co. owns Mountain Dew and distributes Rockstar[33].

196. Full modelling of the interactions between parent companies and smaller brands would be impractical given the number of energy drink brands and multiple shareholders. We have modelled energy drinks manufacturers and non-energy drink manufacturers entirely separately.

[33] Information on the ownership of different energy drink brands was taken from Caffeine Informer. https://www.caffeineinformer.com/the-15-top-energy-drink-brands

3.3 Indirect costs and benefits:

197. This policy is designed to only affect the consumption of energy drinks for under-16s.

198. However, by not being exposed to energy drinks from a young age, lifetime consumption may drop as a result in some cases.

199. We have no evidence to suggest that this is the case and as such this effect is not monetised.

200. If this were to be borne out it would increase long term costs to industry through additional lost sales.

201. In Annex B we have conducted indicative analyses to show when the policies would break even if a long term impact was made to energy drink consumption.

202. There are additional indirect benefits to the UK economy due to some of the displaced sales from energy drinks (see para 94).

Option 3: Statutory regulation banning energy drink sales to under-18s

4.0 Summary

203. The costs of this policy are lost sales to 16 and 17 year olds in addition to all the costs associated with policy option 3.

204. As in to policy option 3, there are quantified costs with unquantified benefits.

4.0.1 Summary Tables

205. These are the monetised cost and benefits of this policy option. Figures are modelled over the standard appraisal cycle of 10 years at a discount rate of 3.5%. The sum of these discounted figures is summed and itemised below as a present value.

206. Other policies in the Childhood Obesity Chapter 2 programme are appraised over 25 years where health benefits have been monetised. See Annex A for these costs modelled over 25 years.

Total NPV (10 year)	-£70m
Costs	**Present Value**
Familiarisation Costs	£41k
On-going Admin Costs	£68m
Enforcement Costs	£2.3m
Lost markup to retailers	£56m
Lost markup to energy drink manufacturers	£365m
Benefits	
Gained markup to non-energy drink manufacturers	£328m
Gained sales to other businesses (indirect benefit)	£92m

4.0.2 Cost Summary

207. Additional costs come from additional lost sales to 16 and 17 year olds.

208. **Costs are much higher for this age group.** Costs to energy drink manufacturers are nearly doubled by extending the ban by 2 years of age, however 16 and 17 year olds make up only 16% of 6-17 year olds by population. This is due to no voluntary action already taking place in this sector and because 16 and 17 year olds are the highest consumers of energy drinks. These factors are offset by more displacement benefits; however a proportion of these are indirect benefits.

4.0.3 Benefits Summary

209. **The evidence supporting extending the ban to 16 and 17 year olds is unclear.** Our data sources group 16 and 17 year olds in a category of 16-24 year olds meaning their caffeine 'safe' thresholds are comparable with adults. However, many studies looking at the side effects of caffeine consumption group 16 and 17 year olds as 10-17 year olds.

3.0.4 Key Assumptions

210. The most sensitive assumption is that where energy drink sales are banned, children will spend their entirety of their fixed energy drinks budget elsewhere in the UK. This is modelled identically as in policy option 2 (see para 35).

4.1 Costs

211. We have assumed all transition and on-going administrative costs remain the same as in Option 2. Identification checking costs remain the same because this is a function of the number of transactions of those who look under-25 years old who will be asked for identification under the 'Challenge 25' rules (see para 80).

212. Therefore, the additional monetised costs come from lost sales to 16 and 17 year olds.

4.1.1 Lost Sales to 16 and 17 year olds

213. The number of litres of energy drink consumed per month by 16 & 17 year olds can be found in para 106.

214. The lost sales to industry are modelled in the same way as for policy option 2 and are a function of the number of litres of energy drink consumed.

215. The only assumption that has changed is we now assume there is 0% of voluntary action, as all current voluntary action has been for under-16s.

216. This gives us the additional costs of extending the ban to 16 and 17 year olds. In combination with the costs outlined in policy option 2, we have a total cost for policy option 3.

217. Despite 16 and 17 year olds being a much smaller population, extending the ban to this group has large impacts due to this group being the largest consumers of energy drinks and having no voluntary action in this sector.

4.1.2 Small and Micro Businesses Assessment

218. As costs are calculated identically between policy option 2 and 3, the small and micro business assessment remains the same as covered in para 118.

219. This policy option has the same familiarisation and ongoing administrative costs; however, there are larger lost sales costs. The lost sales costs to retailers are estimated at a total of £56m net present value over 10 years.

220. As covered in para 118, it is not possible to quantify the exact impact on small and micro businesses; however, a large amount of these costs will fall to small and micro businesses.

4.1.3 Business Impact Target (BIT) Calculations

221. Except for enforcement costs, all costs modelled here are direct costs to business and in scope for BIT.

222. Displaced sales to non-energy drinks manufacturers are a benefit to private business that accrues as a direct result of the policy. As such, it reduces the net cost to business per year and is in scope for the BIT.

223. Other gained sales represent an indirect benefit to the UK economy. These are in the Net Present Value as a benefit, but excluded from the BIT calculations.

224. Due to the displacement assumptions (see para 91) we assume sales are entirely displaced elsewhere due to under-18s spending their entire energy drinks budget. 90% of these are direct benefits displaced to non-energy drink manufacturers, with the remaining 10% being an indirect benefit displaced elsewhere in the UK economy. This means whilst the net present value remains the same due to the benefits and costs cancelling each other out, the equivalised annual direct costs to business are much higher for this policy.

4.2 Benefits

4.2.1 Un-monetised Benefits and Breakeven Analysis

225. Due to the uncertainties of behavioural change beyond the age of 18 (see para 197) and long forecasting timescales, it is not possible to quantify the benefits from a reduced calorie intake. A breakeven analysis from calorie benefits alone is included in Annex B.

226. Our best available evidence on caffeine consumption (a European Food Safety Authority Report[20]) does not give quantified levels of harm for varying levels of caffeine consumption. Therefore, we cannot model the health benefits of reduced caffeine consumption.

227. We do not expect this evidence base to improve with time due to study ethics likely preventing any randomised control trials on children. This means the evidence is likely to remain observational. Current observational trials are unable to establish specific levels of harm from varying levels of caffeine consumption.

228. However, there are a number of identified possible health decrements from energy drink and caffeine consumption. These are discussed at length (see para 150) and continued in para 230 onwards.

229. 24% of 6-9 year olds and 69% of 10-17 year olds drink energy drinks (see para 100). The benefits would need to amount to £1.70 per energy drinking 6-17 year old per year (based on a 10 year average net costs) for the policy to breakeven.

4.2.2 Caffeine Consumption and Health

230. **Based on the available evidence, the 'safe' caffeine consumption levels for 16 and 17 year olds are the same as for all adults.** As outlined in para 146, the European Food Safety Authority state that 3mg of caffeine/kg of body weight gives rise to no health concerns. To convert this to a 'safe' caffeine threshold, we require average body weight. Our best data source: The Health Survey for England groups 16-24 year olds together; weight is not published, only BMI. Regardless, the implication from this is that the 'safe' limit for 16 and 17 year olds would be identical to that of adults 18-24.

231. **The health decrements from excess caffeine consumption are outlined in Option 2.** The health decrements resulting from energy drink consumption are outlined in para 146 onwards. These are mostly still applicable to 16 and 17 year olds, although the absolute amount of caffeine required will be higher due to higher body weight.

232. **There is limited specific evidence to suggest a biological reason 16 is a more appropriate age than 18 for a ban.** There is evidence to suggest that calcium is particularly important during pubertal growth[34] (8-13 for girls and 10-15 for boys)[35]. Caffeine has been shown to interfere with intestinal calcium absorption[36].

4.2.3 Reduced Calorie and Sugar Reductions

233. Calorie and sugar savings from reduced consumption are outlined in para 181.

234. Calorie and sugar savings are highest for this age group as they are the highest energy drink consumers.

235. The benefits from calorie and sugar savings are synonymous with the non-monetised benefits outlined in para 182 for under-16s.

[34] Del Valle, H. B., Yaktine, A. L., Taylor, C. L., & Ross, A. C. (Eds.). (2011). *Dietary reference intakes for calcium and vitamin D*. National Academies Press

[35] Carrascosa, A., Yeste, D., Moreno-Galdó, A., Gussinyé, M., Ferrández, Á., Clemente, M., & Fernández-Cancio, M. (2018). Pubertal growth of 1,453 healthy children according to age at pubertal growth spurt onset. The Barcelona longitudinal growth study. *Anales de Pediatría (English Edition)*.

[36] Heaney, R. P. (2002). Effects of caffeine on bone and the calcium economy. *Food and chemical toxicology*, *40*(9), 1263-1270

236. The benefits from reduced dental cavities (see para 186) are likely to be higher for this age group as any cavities would be on adult teeth for this age group. These benefits remain un-monetised.

4.2.4 Non-Energy Drink Manufacturer's Gained Sales

237. These are calculated in the same was as for policy option 3 (see para 194). As with lost sales they scale with the number of litres of energy drink consumed. These are higher for 16 and 17 year olds due to no voluntary action and this age group being the highest consumers of energy drinks.

4.3 Indirect costs and benefits:

238. This section uses the same logic as policy option 3.

239. This policy is designed to only affect the consumption of energy drinks for under-18s.

240. However, by not being exposed to energy drinks from a young age, lifetime consumption may drop as a result in some cases.

241. We have no evidence to suggest that this is the case and as such this effect is not monetised.

242. If this were to be borne out, it would increase long term costs to industry through additional lost sales.

243. In Annex B we have conducted indicative analyses to show when the policies would break even if a long term impact was made to energy drink consumption.

244. There are additional indirect benefits to the UK economy due to some of the displaced sales from energy drinks (see para 94).

Annex A: 25 Year Appraisal

245. Other Childhood Obesity Plan Chapter 2 policies have been appraised over 25 years. This is because the monetised health benefits from reducing childhood obesity do not manifest themselves until much later in life. Therefore, to appropriately assess the costs that are borne immediately with the benefits that come much later a 25 year appraisal cycle is more appropriate.

246. Since it has not been possible to monetise the health benefits for this impact assessment, this policy has been appraised over the standard 10 year cycle in line with HM Treasury Green Book guidance.

247. For consistency and completeness alongside other Childhood Obesity Plan Chapter 2 policies; we have appraised the costs and benefits over 25 years and presented them below.

Policy Option 2: Statutory ban of the sale of energy drinks to under-16s

Total NPV (25 year)	-£144m
Costs	**Present Value**
Familiarisation Costs	£41k
On-going Admin Costs	£139m
Enforcement Costs	£5.1m
Lost markup to retailers	£56m
Lost markup to energy drink manufacturers	£367m
Benefits	£0m
Gained markup to non-energy drink manufacturers	£330m
Gained markup to other businesses (indirect benefit)	£93m

Policy Option 3: Statutory ban of the sale of energy drinks to under-18s

Total NPV (25 year)	-£144m
Costs	**Present Value**
Familiarisation Costs	£41k
On-going Admin Costs	£139m
Enforcement Costs	£5.1m
Lost markup to retailers	£111m
Lost markup to energy drink manufacturers	£729m
Benefits	£0m
Gained markup to non-energy drink manufacturers	£656m
Gained markup to other businesses (indirect benefit)	£184m

Annex B: Illustrative Calorie Modelling

248. Despite being excluded from the net present value, using the calorie reductions outlined in para 181, we have been able to monetise benefits from reduced instances of obesity related diabetes, chronic heart disease, stroke, colorectal and breast cancers. A summary of how these benefits are modelled is included in para 254.

249. For the purposes of these breakeven analyses, we have assumed the calorie reductions outlined in para 181 are entirely sustained throughout life. This calorie reduction is implicitly derived from continued abstinence of energy drink consumption; this will have additional large scale costs to industry. These costs are modelled identically to the costs described in the main policy options; covering England only.

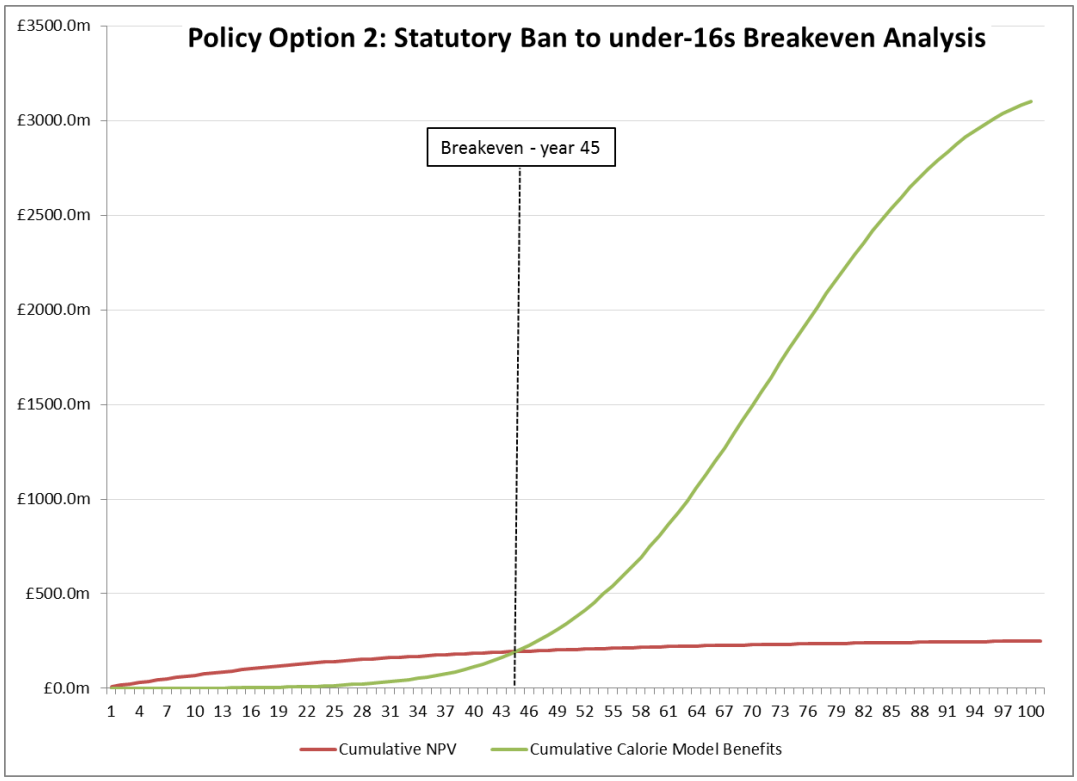
250. These breakeven analyses are only indicative and have large uncertainties, due to the assumption based nature of the calorie reductions (see para 181) and the long forecasting horizon.

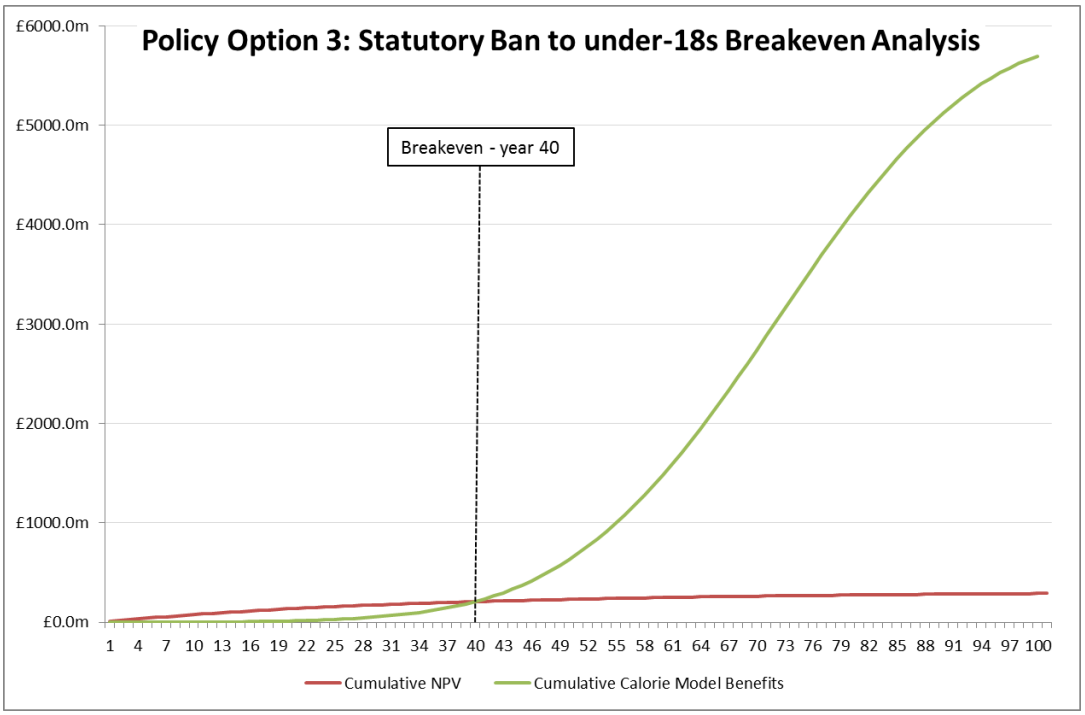
Conclusions of Illustrative Calorie Modelling

251. Obesity related instances of these 5 diseases typically occur much later in life; as such the monetised benefits calculated only accrue from 30 years in to the future as children affected by the policy become of age to suffer from these diseases. This means the policy does not break even until many years in the future.

252. However, these only represent a small number of the benefits. Any of the benefits discussed that are not related to obesity, such as those accrued through reduced caffeine consumption, are not included in this monetisation.

253. A statutory ban on energy drink sales to under-18s (policy option 3) sees cumulative costs equal cumulative benefits sooner. This is because 16 and 17 year olds are the highest consumers of energy drinks. Therefore, they benefit from the greatest calorie reduction, resulting in the greatest BMI reduction and therefore the greatest future modelled benefits. This is not to say it is the preferred option, as previously discussed, these are only monetising a small portion of the full range of benefits and does not reflect the full range of evidence.





Estimating monetised benefits from a calorie reduction

254. DHSC have a model that turns a daily calorie reduction in to a monetised benefit. The DHSC Calorie Model is used across a number of the consultation impact assessments and a full description of the model is given in the 'Technical Consultation Document: DHSC Calorie Model' published alongside this document. A high-level summary is included below.

255. The DHSC Calorie Model is a cohort-based model implemented in Microsoft Excel using an iterative approach on a yearly basis.

256. The impacts of a change in excess calorie consumption are modelled using a control and treatment scenario, with the control scenario assuming no policy implementation, and the treatment scenario assuming a calorie imbalance reduction. The effects of the policy are measured by comparing the two scenarios over a 25 year period.

257. The model simulates health decrements in adults from 19 to 79 years. It groups them into age, gender, and weight categories. No benefits to children are modelled because they have only very small health benefits over a 25 year period. A future version of the model will include health benefits to children and factor in a longer time horizon.

258. The input to the model is the calorie imbalance reduction per day set by the policy. Changes in weight and BMI caused by the reduction in excess calories are calculated and used as a starting point for the remainder of the analysis within the model.

259. The model then considers the implications of the calorie imbalance reduction on 5 diseases associated with obesity: diabetes, coronary heart disease, stroke, colorectal cancer, and breast cancer. This is done by considering changes in prevalence and mortality rates for each disease caused by changes in BMI to calculate the number of deaths avoided in the treatment scenario. The savings to the NHS are calculated from the reduced treatment of each disease.

260. Reductions in mortality are used to calculate the impact on economic output from an increased workforce. This is done by considering everyone within a cohort to earn the median wage of a person of that age and gender, with a larger workforce present in the treatment scenario.

261. The costs of social care savings are calculated due to a reduced proportion of overweight, obese, and morbidly obese individuals and hence fewer people needing social care in the treatment scenario.

262. Changes in QALYs are calculated from the reduced number of deaths and the reduction of people living with the diseases. These are then converted into monetised QALY using a conversion of how much society values a QALY.

263. Discount rates are applied to monetary values to account for changes in the treatment of costs and benefits that arise over different periods of time. This allows future values to be considered at present value. All figures use the appropriate discount rates as outlined in the HM Treasury Green Book. Economic costs and benefits are discounted at 3.5% for years 0-30, 3.0% for years 31-75 and 2.5% thereafter. Health benefits are discounted at 1.5% for years 0-30, 1.3% for years 31-75 and 1.1% thereafter. Enforcement costs use the health benefit discounting as they are expected to be funded through the fixed health budget.

264. The calculations (which are carried out on a year-by-year basis) are summed to calculate overall changes over a 25 year period.

265. There have been some bespoke updates for the energy drink ban modelling to specifically model the health benefits from a policy that initially only affects calorie consumption in children.

266. The model was extended to 100 years so children affected by the policy have time to age in to the age bracket modelled and likely to suffer from the obesity caused chronic conditions. Discount rates were updated accordingly in line with HM Treasury's Green Book long-term discount rates.

Annex C: Specific Impact Tests

Small and Micro Business Assessment

267. The specific impacts on small and micro businesses are considered individually for each policy option. They are in paras 118 and 218 for policy option 2 and 3, respectively.

Equality Test

268. A separate Equality Analysis will be conducted to assess the potential impact of the policy on groups with protected characteristics as part of the Government's duties under the Equality Act 2010.

Inequality Test

269. A consideration has been made to consider the Secretary of State for Health and Social Care's duty to reduce inequalities with respect to benefits from the health service (under section 1C of the NHS Act 2006).

270. Included in Childhood Obesity, a plan for action: Chapter 2, is a commitment to significantly reduce the gap in obesity between children from the most and least deprived areas. The best data source for inequalities in childhood obesity is the National Child Measurement Programme which measures children in Reception and Year 6. The latest data shows us that obesity rates are significantly higher in more deprived areas of the UK at Reception and Year 6. The obesity rate inequality gap grows as children move from Reception to Year 6; additionally the gap in obesity prevalence has increased significantly over the last 10 years.

Obesity Rate Prevalence by IMD2015 Decile				
		Most Deprived	**Least Deprived**	**Gap**
4 - 5 years old	**2006/07**	12.3%	7.1%	5.1%
	2016/17	12.7%	5.8%	6.8%
10 - 11 years old	**2006/07**	21.5%	12.1%	9.4%
	2016/17	26.3%	11.4%	15.0%
Source: PHE analysis of National Child Measurement Programme				

271. The obesity benefits from a ban on the sale of energy drinks to children remain unquantified in the impact assessment due to the uncertainty of this calculation (see para 182).

272. Evidence on variation of energy drink consumption by socioeconomic status is considered in para 168. Because energy drink consumption is associated with free school meal receipt, we may expect any effects on the obesity rate or health more generally, though uncertain in magnitude, to be concentrated in more deprived groups. This would narrow the health inequalities gap.

273. The post-implementation review will gather evidence of impact and will consider evidence of any differential impact by deprivation.

Competition Test

Does the proposal:

274. Directly limit the number of suppliers?

- The proposal has no explicit limit on the number of retailers and manufacturers that can operate in the market.

275. Indirectly limit the number of range of suppliers?

- Both policy options would apply restrictions to all retailers and manufacturers equally.

276. *Limit the ability of suppliers to compete?*

- The proposals will not limit businesses ability to compete on quality, geographical location, price, advertisement or other grounds on which businesses frequently compete.
- The energy drink industry follows a Code of Practice introduced by the British Soft Drinks Association in 2015[37]. They agree not to market to under-16s, meaning these restrictions should not disadvantage any supplier's promotion or marketing.

277. *Reduce suppliers' incentives to compete vigorously?*
    - The proposals do no exempt businesses from general competition law, introduce or amend intellectual property regime or increase the costs to customers of switching between suppliers.

Sustainability Test

278. It is not thought that the restriction on the sale of energy drinks to children will impact on the sustainability or viability of the market.

Environmental Test

279. We do not expect any substantial impact on the environment as a result of restricting the sale of energy drinks.

Justice Impact Test

280. Restricting the sale of energy drinks would create a new offence. This means we could expect a justice impact as there are new prosecutions for contravening the restrictions.

281. A full Justice Impact Test for the proposals will be carried out after the consultation and the policy details have been finalised.

Rural Proofing

282. It is not thought that the policy proposals will have a significant impact on those living in rural areas.

Human Rights Assessment

283. We recognise that there may be an impact on businesses in terms of Articles 10, 14 and Article 1 of Protocol 1 of the European Convention on Human Rights and would welcome submissions addressing this.

[37] British Soft Drink Association Energy Drinks Code of Practice, 2015: http://www.britishsoftdrinks.com/write/MediaUploads/Soft%20Drinks/Revised_Energy_Drinks_Code_of_Practice_270415.pdf

Annex D: Consultation Questions Summary

284. On Citizen Space, the 'Further evidence' consultation question states:

> Do you have any further evidence or data you wish to submit for us to consider for our final impact assessment?
>
> a) No
> b) Yes – Please note that this data may be used to in our final impact assessment that will be published.
>
> Please provide a short summary of the evidence, data, methodology or assumption your response relates to and upload evidence to underpin your response.

We have provided prompting questions throughout the impact assessment, listed below. Please feel free to respond directly to these by referencing the question number. Any additional evidence is also welcome as free text.

285. If you have agreed to be contacted in your consultation response, DHSC may get in touch regarding any evidence submitted.

1) Are there any further data sources on the number of small businesses that use an Electronic Point of Sale (EPOS) system?

2) Would it take 1 hour to update an Electronic Point of Sale (EPOS) system, or 12 minutes to show a staff member the black 'High Caffeine Content' warning label that is already printed on all drinks containing over 150mg/L of caffeine?

3) On average, does it take 30 seconds to check identification?

4) On average, are retailers inspected for compliance every 3.5 years?

5) Are there any data sources to suggest what children are likely to do with their fixed energy drinks budget should they be banned?

6) Is further information on the profit margins of retailers and manufacturers available?

7) Are there any further data sources on the potential growth for the energy drinks market to children?

8) Are there any further data sources to help us understand the impact of the policy on small or micro businesses?