Cost-effectiveness of a policy-based intervention to reduce melanoma and other skin cancers associated with indoor tanning*

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Abstract

Background The use of indoor tanning devices causes melanoma and other skin cancers with resulting morbidity, mortality and increased healthcare costs. Policymakers require robust economic evidence to inform decisions about a possible ban of such devices to mitigate these burdens.

Objectives To assess the health costs and consequences of introducing a policy-based intervention across England to ban commercial indoor tanning with an accompanying public information campaign.

Methods A cost-effectiveness analysis, adopting a healthcare system perspective, was conducted using a decision model to track a national cohort of 18-year-olds over a lifetime time horizon. A nationwide ban on commercial indoor tanning combined with a public information campaign (the policy-based intervention) was compared with the status quo of availability of commercial indoor tanning. The expected costs (currency, GBP; price year, 2019) and quality-adjusted life-years (QALYs) were calculated. Net monetary benefit (NMB) (net benefit measured in cost compared with an accepted threshold) and net health benefit (NHB) (net gain in QALYs compared with an accepted threshold) of implementation were calculated. A probabilistic sensitivity analysis was used to calculate the probability that the intervention was cost-effective.

Results Compared with the current situation, a ban on commercial indoor tanning combined with a public information campaign would result in 1206 avoided cases of melanoma, 207 fewer melanoma deaths and 3987 averted cases of keratinocyte cancers over the lifetime of all 18-year-olds (n = 618 873) living in England in 2019. An additional 497 QALYs would be realized along with health-care cost-savings of £697 858. This intervention would result in an NMB of £10.6m and an NHB of 530 QALYS. Multiple sensitivity analyses confirmed the robustness of the findings. At a cost-effectiveness threshold of £20 000, there is a 99% likelihood of this policy-based intervention being cost-effective.
The use of indoor tanning devices for nonmedical purposes harms both the skin and the eyes. In 2009, the World Health Organization classified indoor tanning devices (also known as, and hereafter termed, ‘sunbeds’) as carcinogenic. Despite some evidence of decreasing use of commercial sunbeds, the practice of indoor tanning is still widespread in many countries.

People who have used a sunbed increase their risk of melanoma by almost 60%. Incidence rates of basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), collectively known as keratinocyte cancers (KCs), are also increased through sunbed use and, although less commonly life-threatening, KCs are far more prevalent than melanoma. The high cost of diagnosing and treating melanoma and KC among users of sunbeds places financial burdens on healthcare systems of countries where sunbeds are popular.

Various strategies to reduce the harms associated with indoor tanning include increased taxation, public health campaigns and regulations restricting availability of commercial sunbeds. Outright bans of commercial sunbeds have been introduced in Brazil, Australia and Iran and there have been increasing calls from dermatological and oncological organizations to other jurisdictions, including populations that fall under the remit of the National Health Service (NHS) in England, to ban sunbeds. Currently, commercial indoor tanning is legally available in the UK for those aged 18 years and older.

Successful implementation of the ban in Australia was partly attributable to accompanying public health advocacy. Similarly, a public information campaign about the health risks of indoor tanning and possible alternatives would maximize the likelihood of the success of bans elsewhere. Thus, a potentially effective policy-based approach involves a ‘complex intervention’ that encourages positive behaviour change in erstwhile sunbed users. A key consideration for governments is whether such a policy-based intervention would represent value for money from the perspective of the healthcare system. The aim of this study was to determine the cost-effectiveness of a policy-based intervention to reduce the incidence of cutaneous melanoma and KC by banning exposure to commercial sunbeds in England.

Materials and methods

We used a decision model-based cost-effectiveness analysis to address the defined decision problem (Table 1). The study is reported in line with CHEERS criteria (Appendix S1; see Supporting Information). The study did not require ethical approval because data were assimilated from existing sources.

Intervention and comparator

The target population comprised young people eligible to use commercially available sunbeds; we focused on the cohort of all 18-year-olds residing in England in 2019. The implementation of a nationwide ban on commercial indoor tanning combined with a public information campaign (i.e. the policy-based intervention) was compared with the status quo of widespread availability of commercial indoor tanning in England (Table 1).

Model

The decision model structure was conceptualized by following published guidelines and represented the costs and consequences for the defined study cohort. A decision tree was...
linked to a state-transition Markov model (hereafter Markov model), informed by previous work and supported by a rapid review of published economic analyses and advice from three experts (an epidemiologist, an oncologist, and a dermatologist). The decision tree (Appendix S2; see Supporting Information) captured the problem of maintaining the current availability of sunbeds vs. removing them from commercial availability.

The Markov-model component (Figure 1) was used to represent the natural history of the chance of developing melanoma or a KC. It included six health states and 10 ‘tunnel’ states, the latter allowing inclusion of annual mortality risk for 10 years following diagnosis of higher-risk melanoma (>1-mm thick. The proportion of individuals in the cohort who may develop KC was also represented. The decision model was a cohort-based model. This entailed defining a starting age for the cohort that is relevant to the decision problem (here, 18 years of age). The cohort model then follows an 18-year-old through to death, consistent with the assumed time horizon for the model. Death can occur because of mortality from melanoma or another cause (Table 2).

### Mortality

Published sex-specific mortality data for England were used to calculate the annual probabilities of dying from causes unrelated to melanoma, by subtracting the risk of dying from melanoma from all-cause mortality estimates. For those with melanoma, an increased mortality risk was applied to the baseline population risk using available epidemiological data. For those with melanoma >1 mm, the increased yearly risk of melanoma death, starting at 0.06 in the year of diagnosis, was diminished annually to 0.006 in the 10th year and then persisted over the individual’s lifetime. For those with thin melanoma (≤1 mm), an increased annual lifetime risk was applied based on published survival data.

### Prevalence of sunbed use

Age- and sex-specific prevalence of sunbed use (proportion of the population who have ever used an indoor tanning device) was calculated for the cohort (Appendices S3–S5; see Supporting Information). To reflect possible continued sunbed use in noncommercial settings postintervention, we assumed a use prevalence of 2% after the ban.

### Skin cancer incidence and increased risk attributable to sunbed use

The proportion of melanomas attributable to sunbeds estimated in a meta-analysis was subtracted from registered melanoma cases to determine annual sex-specific probabilities of being diagnosed with melanoma not attributable to sunbed use. Data from a UK cohort study were used to determine the annual age- and sex-specific probabilities of developing a KC (either BCC or SCC). The proportion of KCs attributable to sunbed use was subtracted from these probabilities to determine an annual probability of KC not attributable to sunbed use. The pooled risk estimate of melanoma from the meta-analysis [1.59, 95% confidence interval (CI) 1.36–1.85] was assigned to the proportion in each cohort who had used sunbeds before the age of 35. Sunbed users were deemed to have increased risk of KCs (1.48, 95% CI 1.21–2.08) in line with meta-analysis findings.

### Table 1: Key design criteria

| Decision problem | What are the incremental costs and consequences and key drivers of the relative cost-effectiveness of a policy-based complex intervention to reduce instances of skin cancer? |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Intervention     | Public health campaign and widespread ban on the provision of sunbeds in commercial settings in England. A multimedia (including social media, radio and television) public health campaign would highlight the risks of indoor tanning, targeting 18-year-olds to inform people about the ban, and promote alternatives to the use of sunbeds |
| Comparator       | The comparator is the current situation; sunbeds can be provided for use by businesses in England |
| Population       | Potential users of commercial sunbeds who were aged 18 years living in England |
| Model type       | Cohort-based decision tree linked to a state-transition Markov model (‘Markov model’) |
| Software         | Excel 2016 |
| Time horizon     | Lifetime (to a maximum of 100 years): to reflect the long-term consequences of using sunbeds and impact on morbidity and mortality from cutaneous melanoma and/or keratinocyte cancer |
| Cycle length (total number of cycles) | 1 year: (83 total cycles), half-cycle corrections used |
| Discounting      | 3.5% for both costs and consequences to be consistent with published NICE recommendationsa |
| Study perspective | National Health Service (NHS) in England |
| Costs            | National currency (£) at 2019 pricesb |
| Consequences     | Quality-adjusted life-years (QALYs) |
| Uncertainty      | Deterministic: one-way sensitivity analysis; two-way sensitivity analysis; scenario analyses |
| Probabilistic sensitivity analysis | NICE recommended thresholdd of £20 000 to £30 000 per QALY gained |

NICE, National Institute for Health and Care Excellence. aMethods guide for technology appraisal. bUnit costs were inflated to 2019 prices where appropriate, using linear regression based on previous NHS cost increases (https://nhsprocurement.org.uk/health-sector-cost-index-update).
Costs

Healthcare resource use and associated unit costs were calculated in keeping with the study perspective (Table 1) whereby the cost of the public health campaign component of the intervention was covered by NHS England. Campaign costs were derived using information on amounts spent on a previous smoking cessation campaign (Appendix S6; see Supporting Information). Published cost estimates capturing the diagnosis, treatment and monitoring of patients with melanoma were sourced from a rapid review of the literature (Appendix S7; see Supporting Information) that identified previous UK-based economic evaluations.4

Consequences

Health consequences were measured using quality-adjusted life-years (QALYs), the product of additional years of life multiplied by the health-related quality of life (HRQoL) in those additional years. An underlying (baseline) HRQoL, measured by the EuroQol five-dimensional three-level (EQ-5D-3L) descriptive system,27 was applied to the cohort, taking age into account (age-specific HRQoL). Population norms28 for EQ-5D-3L scores in England were used to reflect HRQoL for the proportion of the cohort in lesion-free and postmelanoma states. Age-specific norms for HRQoL were then adjusted for each relevant state in the Markov model. Previously estimated HRQoL values29 were used to produce weighted average multiplier decrements to adjust HRQoL for melanoma (≤ 1 mm, > 1 mm) and KC states (Appendix S8; see Supporting Information). For the proportion of the cohort affected by both melanoma and KC in one model cycle, only one adjustment (for the larger effect) was applied. A HRQoL score of zero was applied to the proportion of the cohort in death states.

Main analysis

Numbers of cases of melanoma and KC averted and melanoma-related deaths avoided in the intervention arm compared with the current situation (control arm) were...
calculated. An incremental analysis compared the difference in total expected costs and expected QALYs generated in the intervention and control arms. If the incremental expected costs and QALYs are positive, an incremental cost per QALY gained [incremental cost-effectiveness ratio (ICER)] should be calculated using the formula:

$$\text{ICER} = \frac{(C_2 - C_1)}{(QALY_2 - QALY_1)}$$

where $QALY_2$ and $QALY_1$ are the total QALYs generated by intervention and current situation, respectively; $C_2$ and $C_1$ are the total healthcare costs generated by intervention and current

### Table 2 Model input parameters

| Parameter | Base case value | Distribution | Mean (alpha) | SE (beta) | 95% Confidence interval | Source |
|-----------|----------------|--------------|--------------|-----------|-------------------------|--------|
| Probabilities and risks | | | | | | |
| Nonmelanoma mortalitya | See Appendix S3 | NA | NA | NA | NA | www.nomisweb.co.uk, Forman21 |
| Prevalence of sunbed useb (18-year-old male) | 0.02 | NA | See Appendix S3 and Appendix S5 | Authors’ age/sex-specific estimates of ‘ever-use’ by cohort |
| Prevalence of sunbed useb (18-year-old female) | 0.043 | NA | See Appendix S3 and Appendix S5 | Authors’ age/sex-specific estimates of ‘ever-use’ by cohort |
| Time from exposure to sunbed to diagnosis (years) | 9 | Normal | 9 | 0.9 | 7.24–10.76 | Cust et al.40 |
| Probability of melanoma in population (18-year-old female)c | 0.00005 | See Appendix S3 | NA | NA | NA | Forman et al.23 |
| Probability of keratinocyte cancer in population (18-year-old female)d | 0.00001 | See Appendix S3 | NA | NA | NA | Venables et al.36 |
| Relative risk: melanoma with sunbed usee | 1.59 | Lognormal | 1.59 | 0.09 | 1.36–1.87 | Boniol et al.3 |
| Relative risk: keratinocyte cancer with sunbed usef | 1.48 | Lognormal | 1.48 | 0.14 | 1.21–2.08 | Wehner et al.4 |
| Probability of melanoma >1 mm | 0.354 | Beta | (28.3) | (51.7) | 0.253–0.461 | Sacchetto et al.41 |
| Mortality risk following melanoma >1 mm (year 1)g | 0.0555 | Normal | 0.0555 | 0.00555 | 0.0446–0.0664 | Authors’ estimate24 |
| Mortality risk following melanoma >1 mm (≥ year 10)h | 0.0056 | NA | NA | NA | NA | Authors’ estimate24 |
| Mortality risk following thin melanoma (increased mortality lifetime risk)i | 0.0056 | NA | NA | NA | NA | Authors’ estimate24 |
| Utilities | | | | | | |
| No melanoma (18-year-old)j | 0.929 | See Appendix S3 | NA | NA | NA | Janssen et al.28 |
| Thin melanoma k | 0.93j | Normal | 0.93 | See Appendix S8 | Wilson et al.29 |
| Keratinocyte cancerk | 0.93 | Normal | 0.93 | See Appendix S8 | Authors’ assumption20 |
| Melanoma >1 mm k | 0.837m | Normal | 0.84 | See Appendix S8 | Wilson et al.29 |
| Costs | | | | | | |
| Keratinocyte cancer treatmento | £1348 | Normal | £1058p | £1060p | £850–£1265p | Vallejo-Torres et al.42 |
| Thin melanoma treatmento | £1338 | See Appendix S7 | £1338 | See Appendix S7 | Wilson et al.29 |
| Melanoma >1 mm treatmento | £3182 | See Appendix S7 | £3182 | See Appendix S7 | Wilson et al.29 |
| Nonmelanoma death | £0 | NA | NA | NA | NA | Authors’ assumption |
| Melanoma deatho | £4686 | Normal | £4265p | £4270p | £3429–£5101p | Wilson et al.29 |

(continued)
situation, respectively. This ICER was compared with the current threshold of acceptability used in the context of the NHS in England (£20 000 to £30 000). It is not necessary to calculate an ICER if the intervention produced additional benefits for reduced costs, because the intervention is said to dominate its comparator and is, consequently, deemed a good use of healthcare resources. Net monetary benefit (NMB) (net benefit measured in cost compared with the lower £20 000 bound of the threshold) and net health benefit (NHB) (net gain in QALYs compared with the lower £20 000 bound of the threshold)\textsuperscript{16} of the intervention were calculated using the lower £20 000 bound of the threshold range.

Sensitivity analysis

The following three deterministic sensitivity analyses were used to understand the key drivers of cost-effectiveness: one-way sensitivity analysis [model input parameters (Table 2) varied one at a time], two-way sensitivity analysis (input parameters varied two at a time) and scenario analyses (analysis run using different assumptions). A probabilistic sensitivity analysis (PSA) was used to identify the joint effect of varying defined parameters simultaneously.\textsuperscript{11} A PSA involves running the decision model a number of times (iterations, here set at 5000) and calculating a series of expected costs and QALYS for each intervention based on model input values from specified ranges and distributions (Appendix S9; see Supporting Information).

In the one-way sensitivity analysis, single predefined parameters of interest (Appendix S10; see Supporting Information) were varied one at a time using extreme bounds of plausible values. In the two-way sensitivity analysis (Appendix S11; see Supporting Information), treatment costs (up to 200% of base case value, using 20% increments) and treatment effects (up to 50% of base-case value, using 5% increments) were varied in combination. This sensitivity analysis was based on the knowledge that newer, more expensive treatments for advanced melanoma and adjuvant therapies\textsuperscript{12} have been approved for use in the UK (current estimates not publicly available).

Four scenario analyses were conducted to account for potential negative effects of removing sunbeds, lower melanoma risk from sunbed use, different public health campaign costs and increased average costs of treating melanoma >1 mm. A potential negative health effect (anxiety) of removing the availability of sunbeds was explored by using a utility decrement multiplier (range 0–10%). The cutoff point at which the NMB gained fell below £0 was calculated to show the maximum amount of disutility (i.e. perceived harm from denial of use) needed to question the potential cost-effectiveness of the intervention. The assumed summary relative risk of melanoma was changed in the main analysis from 1.59 to 1.2\textsuperscript{3} and applied to all sunbed users. The effect of assuming different campaign costs was tested by systematically varying this parameter to determine the price at which the intervention would become cost-neutral (zero incremental costs between the intervention and current practice).

Results

There were 618 873 adults (51% of whom were male) aged 18 years residing in England in 2019, with one estimated
commercial sunbed in operation for every 2954 residents. When compared with the current availability of sunbeds over the lifetime of this cohort, the introduction of the policy-based intervention would generate reductions of 4.8% in melanoma cases (n = 1206), 4.6% in melanoma deaths (n = 207) and 3.3% in numbers of KCs (n = 3987). These translate to an additional 497 QALYs with a cost-saving to NHS England of £697 858, meaning that the intervention dominates the current situation comparator (Table 3) as it increases health and saves money. Based on the lower £20 000 bound of the threshold, the intervention would result in an incremental net benefit (INB) of £10.6 million and an NHB of 530 QALYs.

Sensitivity analysis

The PSA results indicated a low degree of parameter uncertainty (Appendix S9). At a cost-effectiveness threshold of £20 000 per QALY, there is a 99% likelihood of the intervention being cost-effective.

The one-way sensitivity analysis demonstrated that extreme plausible worst-case scenario values for each parameter of uncertainty (i.e. favouring the current situation) resulted in the intervention always being cost-effective (Table 4). In the worst-case scenario where public health campaign costs were set to £3.4 million, an additional QALY would be realized for a cost of £3225, substantially less than the lower bound of the £20 000 to £30 000 threshold range of cost-effectiveness. If the lowest prevalence of sunbed use is assumed (e.g. 0.0098 and 0.0046 for an 18-year-old woman and man, respectively), a cost of £2173 per QALY gained would be realized. For all other one-way sensitivity analysis inputs, the policy-based intervention remained dominant in each worst-case scenario (Table 4).

The two-way sensitivity analysis (Appendix S11; see Supporting Information) showed that the main analysis was robust to combining treatment costs and associated melanoma treatment effectiveness. The intervention would remain the dominant option with any combination of the prespecified increases in treatment costs and effects. If base-case treatment costs were increased by 20%, with a resultant 50% reduced mortality from thicker melanomas, an INB of £6.5 million would be realized. If a 200% increase in base-case treatment costs for thin melanomas with a modest 5% reduction in their mortality is assumed, the INB would be just over £10.75 million (Appendix S11).

The effect of applying a disutility multiplier to capture negative (anxiety) consequences of sunbed removal (Appendix S12; see Supporting Information) had to be a 7.5% decrement (0.925 *HRQoL) to call into question the cost-effectiveness of the intervention. Where a lower summary relative risk value of 1.23 was applied to all sunbed users, the intervention remained the dominant option generating an INB of £4.97 million. The intervention would be cost-neutral with the current situation if the public health campaign costs were set at £1.69 million. Campaign costs would need to be set at more than £11.97 million to generate an additional cost per QALY gained greater than £20 000 per QALY.

### Discussion

To reduce harm from indoor tanning, a policy-based intervention involving a nationwide ban on commercial indoor tanning and a public health campaign is highly likely to be a good use of healthcare resources from the perspective of NHS England. Previous economic evaluations have demonstrated how other policy-based interventions capable of effecting change at the population level, such as the taxation of sugary foods and beverages, or raising the legal age of smoking, are typically an efficient use of resources. If NHS England invested in a public health campaign to support the ban on sunbeds, we estimate that melanoma and KC burden would be reduced, NHS resources would be saved and deaths averted. Key drivers of cost-effectiveness are the estimated prevalence of sunbed use and public health campaign cost. Sensitivity analyses demonstrated the robustness of these findings.

Our results reflect those from previous explorations of the effect of such legislation on healthcare systems and productivity in America, Europe and Australia, and therefore add to the growing body of evidence supporting a ban on...
commercial sunbeds. We used a structured and transparent approach to assimilating all available data to understand the economic impact of banning sunbeds alongside a public health campaign funded by NHS England. We quantified the potential effect of uncertainty in input values and key assumptions in sensitivity analyses. For each assumption, a conservative approach was employed favouring the current situation rather than the intervention.

The key limitation of this study was our reliance on publicly available data that may not reflect current clinical and clinical settings.

### Table 4 One-way sensitivity analysis results

| Model input parameter* | Assumed parameter value | Incremental cost per QALY gained | Incremental net benefit b |
|------------------------|-------------------------|---------------------------------|---------------------------|
|                        | Worst-case estimate     | Best-case estimate              | Worst-case estimate       | Best-case estimate       |
| Campaign cost          | £1 339 807              | £0                              | £3225                     | Not applicable: intervention dominant |
| Sunbed use: current situation | Low c | High d | £2173 | Not applicable: intervention dominant |
| Relative risk of melanoma | 1.36                 | 1.85                            | Not applicable: intervention dominant |
| First year mortality risk: melanoma > 1 mm | 0.0446 | 0.0664 | Not applicable: intervention dominant |
| Proportion of melanomas > 1 mm | 0.25 | 0.46 | Not applicable: intervention dominant |
| Sunbed use: intervention | 0.03                 | 0.01                            | Not applicable: intervention dominant |
| Relative risk of keratinocyte cancer | 1.21                 | 2.08                            | Not applicable: intervention dominant |
| Disutility multiplier: keratinocyte cancer | 0.96 | 0.90 | Not applicable: intervention dominant |
| Treatment cost: keratinocyte cancer | £1083.66 | £1612.00 | Not applicable: intervention dominant |
| Disutility multiplier: melanoma > 1 mm | 0.91 | 0.77 | Not applicable: intervention dominant |
| Disutility multiplier: thin melanoma | 0.96 | 0.90 | Not applicable: intervention dominant |
| Treatment cost: melanoma > 1 mm | £2558.36 | £3805.68 | Not applicable: intervention dominant |
| Treatment cost: thin melanoma | £1075.81 | £1600.32 | Not applicable: intervention dominant |
| Cost of death: melanoma | £3767.19 | £5603.89 | Not applicable: intervention dominant |
| Male : female ratio | 1.3                     | 2.9                             | Not applicable: intervention dominant |

QALY, quality-adjusted life-year. aAppendix S9 (see Supporting Information) describes how the assumed values for best and worst case estimates were generated. bIncremental net benefit = (£20 000 × incremental QALYs) – incremental costs. c.g. 0.0098 for an 18-year-old woman. d.e.g. 0.0869 for an 18-year-old woman.
Advanced melanoma treatments have increased alongside the inclusion of a ban on indoor tanning. Clinical trials are under way in patients with stage 2 disease, a much larger patient population than stages 3 or 4. Capturing the true cost of drug acquisition and administration, toxicity effects and patient follow-up is not unique to skin cancer, but rather reflects the fast pace of technological development in cancer care generally, and the challenge to collect these data.\textsuperscript{32,36}

The sex-specific use of sunbeds was estimated using a conservative value (female : male ratio = 1.76:1) favouring the status quo. This value, based on plausible published estimates, likely underestimates the proportion of female users in England, and a less conservative value would make the intervention appear even more cost-effective.

Results from the meta-analysis\textsuperscript{3} used here and in previous economic evaluations have recently been questioned,\textsuperscript{37} in particular the assumption about ‘ever-use’ and the metric for first use at younger ages owing to potential heterogeneity in the definition of ‘younger age’. We took a conservative approach in this respect by applying an increased risk to only the proportion of the cohort who first used an indoor tanning device before the age of 35 years, noting that these risk estimates took account of confounding factors (e.g. outdoor tanning). The robustness of the results was further demonstrated in the sensitivity analysis using the lower bound of the plausible range of relative risk estimates from the meta-analysis\textsuperscript{3} and in the scenario where the lower summary relative risk from that study was applied; the intervention remained the dominant option in both.

We assumed no effect on HRQoL for the postmelanoma states in this analysis. There is some evidence, for example, that fear of cancer recurrence is a measurable phenomenon in cancer survivors generally,\textsuperscript{18} and in people with a personal history of melanoma specifically.\textsuperscript{39} If these utility decrements had been included in the model, the estimated QALYs gained from removing sunbeds would appear even larger than those currently estimated.

In the hypothetical scenario presented, all intervention costs were assigned to the public health campaign component of the intervention. An alternative use of resources would be to fund a ‘sunbed buy-back’ scheme\textsuperscript{5} to encourage commercial sunbed providers to repurpose their businesses. In a situation where an additional £10.97 million in intervention costs were available for this purpose, each provider in England could be paid £3709 per premise;\textsuperscript{3} alongside the inclusion of a £1 million public health campaign (total intervention costs £11.97 million), this would remain a cost-effective use of NHS resources.

In conclusion, this study provides evidence that introducing a ban on indoor tanning with a supporting public health campaign in England is cost-saving from an NHS perspective, resulting in health gain for a population of 18-year-olds. In view of these findings and the potential to reduce harm, the implementation of a ban on the provision of indoor tanning should be given serious consideration.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher’s website:

Appendix S1 CHEERS checklist
Appendix S2 Decision tree
Appendix S3 Age- and sex-specific input parameters
Appendix S4 Identifying the evidence to estimate the prevalence of indoor tanning
Appendix S5 Calculating the prevalence of age-related and sex-specific indoor tanning use
Appendix S6 Identification of costs of the intervention
Appendix S7 Identifying the costs of treating skin cancer
Appendix S8 Utility multiplier decrements
Appendix S9 Probabilistic sensitivity analysis
Appendix S10 One-way sensitivity analysis
Appendix S11 Two-way sensitivity analysis
Appendix S12 Scenario analysis: applying disutility for denial of sunbed use.

Video S1 Author video.