Sunbed use in children aged 11-17 in England: face to face quota sampling surveys in the National Prevalence Study and Six Cities Study

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ABSTRACT

Objectives To quantify the use of sunbeds in young people across England, identify geographical variation, and explore patterns of use, including supervision.

Design Two random location sampling surveys.

Setting National Prevalence Study in England; Six Cities Study in Liverpool, Stoke/Stafford, Sunderland, Bath/Gloucester, Oxford/Cambridge, and Southampton.

Participants 3101 children aged 11-17 in the National Prevalence study and 6209 in the Six Cities study.

Results In the National Prevalence Study 6.0% (95% confidence interval 5.1% to 6.8%) of those aged 11-17 had used a sunbed. Use was higher in girls than in boys (8.6% (7.2% to 10.0%) v 3.5% (2.6% to 4.4%), respectively), in those aged 15-17 compared with those aged 11-14 (11.2% (9.5% to 12.9%) v 1.8% (1.2% to 2.4%), respectively), and in those from lower rather than higher social grades (7.6% (5.7% to 9.5%) v 5.4% (4.5% to 6.3%), respectively). Sunbed use was higher in the "north" (11.0%, 8.9% to 13.0%) than in the "midlands" (4.2%, 2.5% to 5.8%) and the "south" (4.2%, 3.3% to 5.2%). In the Six Cities Study, sunbed use was highest in Liverpool and Sunderland (20.0% (17.5% to 22.4%) and 18.0% (15.6% to 20.3%), respectively), with rates especially high in girls, those aged 15-17, or from lower social grades. Mean age of first use was 14, and 38.4% (34.7% to 42.1%) of children used a sunbed at least once a week. Nearly a quarter (23.0%, 19.8% to 26.1%) of children had used sunbeds unsupervised in a tanning/beauty salon or gym/leisure centre.

Conclusions Sunbed use by children is widespread in England, is often inadequately supervised, and is a health risk. National legislation is needed to control sunbed outlets.

INTRODUCTION

The incidence of malignant melanoma is rising faster than that of any other cancer in the United Kingdom, rates having more than quadrupled since the 1970s.1 Although this is partly because of earlier detection and better diagnosis, increased exposure to risk factors is also believed to be important.2 Natural or artificial ultraviolet radiation is an important factor, and the International Agency for Research on Cancer recently upgraded exposure to ultraviolet radiation to level 1—that is, “carcinogenic to humans.”3 Sunbed use before the age of 35 increases the risk of developing malignant melanoma by 75%4 and has been implicated in an estimated 100 deaths from the disease annually in the UK.5 Sunbeds might also accelerate skin ageing and cause eye damage or immune suppression, while their purported health benefits are unproven.6 As proposed by the Cancer Reform Strategy,7 the National Cancer Action Team, supported by the Department of Health, commissioned Cancer Research UK to investigate sunbed use in those aged under 18. Market research companies undertook the National Prevalence and the Six Cities studies, the latter focusing on areas with differing access to tanning salons. We report the frequency, location, and supervision of sunbed use by those aged 11-17; geographical variation; and the effects of age, sex, and social class. Unless stated otherwise, data refer to England.

METHODS

Cancer Research UK commissioned BMRB Omnibus and LVQ Research to carry out interviews using questions developed after extensive consultation with researchers.

National Prevalence Study

Children were interviewed8 as part of the Youth Omnibus Survey after the weekly Adult BMRB Face-to-Face Omnibus interview of a representative sample of adults across Great Britain.9 This uses a random location sampling technique,10 based on an amalgamation of output areas, the basic building block used for outputs from the 2001 census in Great Britain. Output areas were grouped into sample units of about 300 households, by using their ACORN profiles based on both demographic and purchasing consumer details.11 Target quotas were set for interviews for age/sex and...
employment status for the adults to take into account the likelihood of being available at home for interview.

If more than one child aged 11-17 was available in the house, the one with the most recent birthday was selected. Written permission was obtained from both parent and child if the child was aged under 15, or from the child alone if they were older. Trained interviewers carried out interviews using a computer assisted personal interviewing (CAPI) system. A minimum of 10% of respondents were contacted again by phone or letter to confirm classification and answers to key questions.

Initial “scoping” in 988 children between 21 February 2008 and 23 April 2008 across Great Britain gave a 5.8% prevalence of sunbed use with 95% confidence interval of 4.3% to 7.3%. Powered on this figure, we calculated that a final sample size of 3509; the 3101 conducted in England between 9 October 2008 and 21 April 2009 gave a total of 1000 interviewees a city to provide estimates of variations in sunbed use with acceptable confidence intervals. A further 3703 interviews between 17 October and 16 November 2008 gave a total sample size of 6209.

**Questionnaires and analyses**

The two studies included the same core questions. An extra question was added to both questionnaires after the pilot study to ascertain if/how sunbed use was supervised in staffed premises. The Six Cities Study also recorded average duration of sunbed sessions.

We included pilot data from both studies in the final analyses after confirming there was no double counting of interviewees. “Rim weighting” was performed by BMRB Omnibus to correct for differential sample rates across the age/sex/social grade and region range to match the marginal totals in the National Readership survey in the National Prevalence Study (done separately for Great Britain and England alone) and by LVQ Research to correct for differential sample rates across the age and sex range in the Six Cities Study. All analyses are presented on the weighted samples, with a design effect taken to be 1, given the size of the samples and the numbers of weeks over which the interviewing

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**Table 1** | National Prevalence Study: unweighted and weighted total sample numbers* by sex, age group, and social grade in England

| Total | Boys | Girls | Age (years) | Social class |
|-------|------|-------|-------------|--------------|
|       |      |       | 11-14       | 15-17 AB    |
| Total (unweighted) | 3101 | 1620 | 1481 | 1844 | 1257 | 560 | 867 | 716 | 510 | 448 |
| Total (weighted) | 3101 | 1589 | 1512 | 1725 | 1376 | 823 | 845 | 655 | 508 | 468 |

**Sex:**

| Male | Female |
|------|--------|
| 1589 | 1512   |

**Age (years):**

| 11-14 | 15-17 |
|-------|-------|
| 1725 | 1376 |

**Social grade:**

| AB | C1 | C2 | D | E |
|----|----|----|---|---|
| 823 | 416 | 407 | 521 | 302 | 823 | 845 | 655 | 508 | 269 |

*Weighted numbers are rounded and thus marginal totals might not add up. Analyses are based on weighted sample.*
was carried out. Confidence intervals were assumed to follow a normal approximation to the binomial distribution. We tested for significance between proportions using sunbeds in different groups by calculating the difference in the proportions, along with an estimate of the standard error; this was calculated with the square root of the sum of the squared standard errors obtained for each group.

RESULTS
We have reported prevalence data and reasons for using or not using a sunbed primarily from the National Prevalence Study to give an unbiased England-wide estimate. Variations in use between cities, and responses specifically from sunbed users, are reported principally from the Six Cities Study to more accurately describe patterns of activity in urban areas with higher sunbed use. Full data from both studies are available online.

National Prevalence Study
Of the 3509 children aged 11-17 interviewed across Great Britain, 6.8% had used a sunbed. There was considerable variation, at 13.6% (95% confidence interval 9.7% to 17.5%) in Scotland, 10.6% (6.0% to 15.2%) in Wales, and 5.9% (5.0% to 6.7%) in England. Subsequent analyses are based on the 3101 children interviewed across England (855 in the pilot study, 2246 in the full study). Tables 1 and 2 show their characteristics, after we reweighted data to the age/sex/social grade and region profiles for England (leading to a slightly different weighted estimate of sunbed use for England).

Q1: “Have you ever used or are you considering using a sunbed?” (all respondents, weighted baseline = 3101)
Overall, 6.0% of children aged 11-17 in England had used a sunbed at least once; a further 14.9% said they might do so in the future (table 3).

Sunbed use was significantly higher in those aged 15-17 than those aged 11-14 (11.2% and 1.8%, respectively) and in girls than in boys (8.6% and 3.5%, respectively). Significantly more girls than boys also said that, although they had not used a sunbed, they might do in the future (17.5% and 12.5%, respectively).

There was also considerable variation in sunbed use across the social grades (fig 1). Use was significantly higher in children from the lower (D and E combined) than the higher (A, B, C1, and C2 combined) social grades (7.6% (5.7% to 9.5%) and 5.4% (4.5% to 6.3%), respectively) and was highest in those from social grade E (10.4% (6.8% to 14.1%)). There was also significant variation in sunbed use across the English regions (table 3), being higher in the “north” (11.0%) than in the “midlands” and “south” (4.2%); use was lowest in London (3.2%).

Q2: “For what reason have you not used a sunbed?”
(weighted baseline=2882 who said they had not used a sunbed; respondents could select multiple options)
Table 4 shows the reasons given for not using a sunbed, grouped into five main categories. Half of all non-users were not interested in getting a suntan, and two out of five believed sunbeds to be a health risk. Less frequently, respondents cited practical reasons (13.5%),

Table 2 | National Prevalence Study: unweighted and weighted total sample numbers* by standard region in England

| Social grade | Total | London | South east | South west | East Anglia | East Midlands | West Midlands | Yorks/ Humber | North west | North |
|--------------|-------|--------|------------|------------|-------------|---------------|---------------|-------------|-----------|-------|
| Total (unweighted) | 3101  | 543   | 853        | 261        | 94          | 243           | 332           | 270         | 316       | 189   |
| Total (weighted)  | 3101  | 534   | 701        | 327        | 116         | 215           | 360           | 304         | 368       | 174   |

Sex:
- Male: 1589, 288, 365, 168, 58, 113, 175, 157, 166, 99
- Female: 1512, 246, 336, 159, 58, 102, 184, 147, 203, 75

Age:
- 11-14: 1725, 284, 390, 187, 70, 127, 207, 170, 202, 88
- 15-17: 1376, 250, 312, 140, 47, 88, 153, 134, 165, 86

Social grade:
- AB: 823, 127, 222, 82, 36, 65, 92, 79, 89, 32
- C1: 845, 135, 186, 99, 29, 63, 100, 76, 108, 50
- C2: 655, 95, 151, 82, 19, 50, 87, 66, 69, 36
- D: 508, 112, 98, 50, 24, 24, 56, 51, 60, 35
- E: 269, 66, 45, 16, 8, 13, 27, 32, 43, 21

*Weighted numbers are rounded and thus marginal totals might not add up. Analyses are based on weighted sample.
including expense, lack of access, and not being allowed/advised not to (4.3%). Other reasons each accounted for <1% of responses.

The main reason for not using sunbeds differed between the sexes and age groups (table 5). For girls, “health risk” was more important than for boys (51.3% and 33.0%, respectively); while for boys “not interested/use other tan option” was more common than for girls (63.9% and 43.6%, respectively). Older children were significantly more likely to give “health risk” as a reason for not using a sunbed than those aged 11-14 (46.0% and 38.7%, respectively). By contrast, younger children were significantly more likely to respond “not being allowed/advised not to use” sunbeds than older children (6.3% and 1.6%, respectively). Reasons for not using sunbeds did not differ significantly by social grade or English region (data not shown).

### Table 3 Use of sunbeds* nationally, by age, sex, region, and city. Figures are percentages (95% confidence intervals)

| National Prevalence Study† | Overall | 3101 | 6.0 (5.1 to 6.8) | 14.9 (13.7 to 16.2) | 78.0 (76.6 to 79.5) |
|----------------------------|---------|------|-----------------|-------------------|-------------------|
| By age (years):            |         |      |                 |                   |                   |
|                           | 11-14   | 1725 | 1.8 (1.2 to 2.4) | 15.6 (13.9 to 17.3)| 81.6 (79.7 to 83.4)|
|                           | 15-17   | 1376 | 11.2 (9.5 to 12.9)| 14.1 (12.3 to 15.9)| 73.5 (71.2 to 75.9)|
| By sex:                    |         |      |                 |                   |                   |
|                           | Boys    | 1589 | 3.5 (2.6 to 4.4) | 12.5 (10.8 to 14.1)| 82.8 (80.9 to 84.6)|
|                           | Girls   | 1512 | 8.6 (7.2 to 10.0)| 17.5 (15.6 to 19.4)| 73.1 (70.8 to 75.3)|
| By region:                 |         |      |                 |                   |                   |
|                           | North   | 846  | 11.0 (8.9 to 13.1)| —                  | —                 |
|                           | North   | 174  | 10.9 (6.3 to 15.6)| 13.2 (8.2 to 18.3)| 75.9 (69.5 to 82.2)|
|                           | North west | 368  | 14.1 (10.6 to 17.7)| 12.2 (8.9 to 15.6)| 73.9 (69.4 to 78.4)|
|                           | Yorkshire and Humber | 304  | 7.2 (4.3 to 10.1)| 11.2 (7.6 to 14.7)| 81.6 (77.2 to 85.9)|
|                           | Midlands overall | 575  | 4.2 (2.5 to 5.8) | —                  | —                 |
|                           | East Midlands | 215  | 3.7 (1.2 to 6.3) | 19.1 (13.8 to 24.3)| 75.8 (70.1 to 81.5)|
|                           | West Midlands | 360  | 4.4 (2.3 to 6.6) | 16.7 (12.8 to 20.5)| 75.6 (71.1 to 80.0)|
|                           | South overall | 1678 | 4.2 (3.3 to 5.2) | —                  | —                 |
|                           | East Anglia | 116  | 7.8 (2.9 to 12.6)| 12.1 (6.1 to 18.0)| 80.2 (72.9 to 87.4)|
|                           | London    | 534  | 3.2 (1.7 to 4.7) | 15.7 (12.6 to 18.8)| 79.0 (75.6 to 82.5)|
|                           | South east | 701  | 4.6 (3.0 to 6.1) | 16.7 (13.9 to 19.5)| 77.9 (74.8 to 81.0)|
|                           | South west | 327  | 4.0 (1.9 to 6.1) | 13.5 (9.8 to 17.2)| 82.6 (78.5 to 86.7)|

### Six Cities Study

#### Table 6 shows characteristics of the 6209 children aged 11-17 interviewed and table 7 shows those of the 673 children who had used a sunbed.

Compared with the National Prevalence Study, sunbed use was higher overall (question 1) in the predominantly urban “Six Cities” population (10.8%, 10.1% to 11.6%; data not shown). There was also wide variability in use between the cities, being significantly higher in Liverpool and Sunderland than the other four cities, both overall (table 3) and across both age groups and sexes (data not shown). This was especially high in girls aged 15-17 in these cities (51.0% (44.6% to 57.4%) and 48.2% (41.3% to 55.1%), respectively; data not shown).

There were significant differences across the cities in why children had not used sunbeds (question 2). Practical reasons deterred more children in both Bath/Gloucester (12.2%, 10.2% to 14.3%) and Southampton (11.2%, 9.2% to 13.2%) than in Liverpool (3.4%, 2.2% to 4.7%), Stoke/Stafford (5.9%, 4.4% to 7.4%), Sunderland (5.3%, 3.8% to 6.8%), or Oxford/Cambridge (6.6%, 5.0% to 8.1%); the most common reason given was expense; data not shown.

**Q3:** “When was the last time you used a sunbed?” (weighted baseline= 673 children who said they had used a sunbed for Q3-7)

Significantly more children in Liverpool and Sunderland had used sunbeds in the past month than in the other four cities (table 8), as had those aged 15-17 (48.7%, 44.4% to 53.0%) compared with younger children (38.3%, 30.6% to 46.0%). In contrast, boys were more likely than girls to have last used a sunbed more than a year ago (16.5% (11.7% to 21.3%) and 8.2% (5.6% to 10.7%), respectively). There were no significant differences across the social grades (data not shown). Of note, three respondents aged 11-14 said...
they last used a sunbed more than five years ago, when aged between 6 and 9.

Q4: “How often do you use a sunbed?”

Overall, 38.4% (34.7% to 42.1%) used a sunbed at least weekly, although this was largely driven by high use in Sunderland and Liverpool. In addition, children aged 15-17 were more likely than younger children to use sunbeds weekly; more boys than girls used a sunbed once a year or less (table 9).

Q5: “How long do you usually spend on a sunbed per session?”

The mean time on a sunbed was 10 minutes a session (median 9), but 16.2% of children spent more than 12 minutes a session. There were significant differences between the cities (figs 2 and 3); children in cities with a high density of sunbeds spent less time per session on a sunbed than those in low density cities.

Q6: “How old were you the first time you used a sunbed?”

The mean age at first sunbed use was 14 for both sexes and all cities except Sunderland, where it was 15. Of note, 7.0% (5.0% to 8.9%) of sunbed users had first done so before the age of 12.

Q7: “Where have you used a sunbed?”

Nearly a quarter of children (23.0%, 19.8% to 26.1%) had used a sunbed at home, but most had used a sunbed in an outlet with staff supervision (57.9%, 54.1% to 61.6%). Of those children using tanning equipment in an outlet, however, 24.7% (21.0% to 28.4%) said they were unsupervised.

### Table 4 | National Prevalence Study: reasons children had not used sunbeds* (weighted baseline=2882)

| Reason                                | No     | % (95% CI) |
|---------------------------------------|--------|------------|
| Not interested/use other tan option†  | 1565   | 54.3 (52.5 to 56.1) |
| Not interested in getting tan         | 1482   | 51.4 (49.6 to 53.2) |
| No need (no detail)                  | 20     | 0.7 (0.4 to 1.0)  |
| No need because already dark skinned/already have tan | 14     | 0.5 (0.2 to 0.7)  |
| Not interested                       | 15     | 0.5 (0.3 to 0.8)  |
| Health risk‡                         | 1202   | 41.7 (39.9 to 43.5) |
| Practical reason‡                    |        |             |
| Overall                              | 390    | 13.5 (12.3 to 14.8) |
| Expense                              | 215    | 7.5 (6.5 to 8.4)  |
| No access to a sunbed/no salons near by | 168   | 5.8 (5.0 to 6.7)  |
| Not allowed/advised not to‡          | 123    | 4.3 (3.5 to 5.0)  |
| Too young                            | 62     | 2.2 (1.6 to 2.7)  |
| Not allowed                          | 38     | 1.3 (0.9 to 1.7)  |
| Salon staff advised against use      | 23     | 0.8 (0.5 to 1.1)  |
| Other‡                               | 179    | 6.2 (5.3 to 7.1)  |

*Weighted numbers are rounded; respondents could select multiple options.
†Options in each group selected by less than 0.5% are not shown.
‡6.2% chose other reasons but these each accounted for fewer than 1% of responses.

### Table 5 | National Prevalence Study: reasons children had not used sunbeds* by age and sex (weighted baseline=2882)

| Age (years) | No  | % (95% CI) |
|-------------|-----|------------|
| 11-14       |     |            |
| Not interested/use other tan option† | 895  | 53.4 (51.0 to 55.8) |
| Health risk | 648  | 38.7 (36.3 to 41.0) |
| Practical reason‡ | 225  | 13.4 (11.8 to 15.1) |
| Not allowed/advised not to‡          | 106  | 6.3 (5.2 to 7.5)  |
| Other‡                                  | 127  | 7.6 (6.3 to 8.8)  |
| 15-17       |     |            |
| Not interested/use other tan option†  | 672  | 55.8 (53.0 to 58.6) |
| Health risk | 554  | 46.0 (43.2 to 48.8) |
| Practical reason‡                    | 163  | 13.5 (11.6 to 15.5) |
| Not allowed/advised not to‡          | 19   | 1.6 (0.9 to 2.3)  |
| Other‡                                  | 50   | 4.1 (3.0 to 5.3)  |

| Sex          | No   | % (95% CI) |
|--------------|------|------------|
| Boys         | 966  | 63.9 (61.5 to 66.3) |
| Girls        | 597  | 43.6 (41.0 to 46.2) |

### Table 6 | Six Cities Study: unweighted and weighted total sample numbers* and percentages by sex, age, and social grade

| Age group (years) | Boys by age | Girls by age | Social grade |
|-------------------|-------------|--------------|--------------|
| 11-14             | 15-17       | Total        | AB           | C1 | C2 | DE | Total |
| Total (unweighted)| 3132        | 3077         | 6209         | 1064|2017|1515|1631|6209 |
| Total (weighted)  | 3549        | 2660         | 6209         | 1071|1985|1520|1634|6209 |

*Weighted numbers are rounded; respondents could select multiple options.
use a sunbed at a gym/leisure centre (16.1% (11.3% to 20.8%) and 9.0% (6.3% to 11.7%), respectively), whereas girls were more likely to use a tanning/beauty salon (73.6% (69.5% to 77.6%) and 49.5% (43.0% to 56.0%), respectively). There was also substantial variability between cities in site of sunbed use; in Liverpool, 94.0% of those aged 11-17 had used a sunbed in an "outlet," significantly more than in any other city and with lower use in the home (table 11).

Older children were more likely to have used a sunbed in an outlet without supervision (21.8%, 18.2% to 25.3%) than younger children (9.4%, 4.8% to 14.1%). Across the cities, unsupervised sunbed use by children in an outlet varied between 16.2% and 25.9%.

**Q8:** “When your sunbed use was supervised, did a person show you how to use a sunbed, and did they give you information about the harm that sunbeds can cause?” (Six Cities study weighted baseline = 213 interviewees between October and November 2008 only who had used a sunbed in a supervised setting)

Of those asked this question in the October-November 2008 interviews, 19.9% (14.5% to 25.2%) said they were not shown how to use the sunbed or given information on the harm sunbeds can cause (table 12).

### DISCUSSION

Around 6% of young people aged 11-17 in England have used a sunbed. Applied to projected 2008...
populations from the Government Actuary Department, this equates to around a quarter of a million children in England potentially at increased risk of developing malignant melanoma. Worryingly, 15% of children who had not used a sunbed said they might do so in the future.

Sunbed use was not uniform, being more common in older than in younger children, though 7% of children in the Six Cities Study said they first used a sunbed while at primary school; the proportion was even higher across the whole of England at 16% (data not shown). Sunbed use was consistently higher in girls than in boys and in those from lower rather than higher social grades. There was also geographical variation; sunbed use by 11-17 year olds was higher in Scotland and Wales than in England; and across England, use was more common in children from the north than the rest of the country. Use was particularly high in Liverpool and Sunderland, where around half of girls aged 15-17 used sunbeds.

Supervision of children using sunbeds was inadequate. In the Six Cities Study more than one in five said they had used a sunbed at home and almost a quarter of children using sunbeds in a tanning/beauty salon or gym/leisure centre said they had not been supervised. Where “supervision” was provided it was unsatisfactory, with only 37% of children saying they were informed of the risks; nationally the figure was even lower (11%).

Table 10 | Six Cities Study: places where children use sunbeds overall, by age, and sex* (weighted baseline=673)

| Overall | At home/friend’s home | At tanning/beauty salon with staff to help | At tanning/beauty salon without staff to help | At gym/leisure centre with staff to help | At gym/leisure centre without staff to help |
|---------|-----------------------|------------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|
|         | No | % (95% CI) | No | % (95% CI) | No | % (95% CI) | No | % (95% CI) | No | % (95% CI) |
| Age group (years): | | | | | | | | | | |
| 11-14 | 152 | 63 | 41.0 (33.2 to 48.8) | 59 | 38.3 (30.6 to 46.0) | 9 | 5.7 (2.0 to 9.4) | 7 | 4.7 (1.3 to 8.0) | 6 | 3.7 (0.7 to 6.7) |
| 15-17 | 633 | 92 | 17.7 (14.4 to 20.9) | 292 | 56.2 (51.9 to 60.5) | 81 | 15.5 (12.4 to 18.7) | 31 | 6.0 (4.0 to 8.1) | 32 | 6.2 (4.2 to 8.3) |
| Sex: | | | | | | | | | | |
| Boys | 235 | 71 | 31.2 (25.2 to 37.3) | 92 | 40.5 (34.1 to 46.9) | 20 | 9.0 (5.3 to 12.7) | 16 | 7.0 (3.7 to 10.3) | 21 | 9.1 (5.4 to 12.8) |
| Girls | 550 | 84 | 18.8 (15.1 to 22.4) | 259 | 58.1 (53.5 to 62.6) | 69 | 15.5 (12.1 to 18.9) | 23 | 5.1 (3.1 to 7.1) | 17 | 3.9 (2.1 to 5.7) |

*Weighted numbers are rounded; respondents could select multiple options; 43 respondents (after weighting) said they “did not know” whether they used sunbed in place with or without supervision or at home.

Table 11 | Six Cities Study: places where children use sunbeds by city* (weighted baseline = 673)

| Overall | At home/friend’s home | At tanning/beauty salon/ gym/leisure centre with staff to help | At tanning/beauty salon/ gym/leisure centre without staff to help |
|---------|-----------------------|-------------------------------------------------|-------------------------------------------------|
|         | No | % (95% CI) | No | % (95% CI) | No | % (95% CI) |
| Liverpool | 207 | 21 | 10.0 (5.9 to 14.1) | 153 | 74.5 (68.5 to 80.4) | 40 | 19.5 (14.1 to 25.0) |
| Stoke/Stafford | 70 | 21 | 30.3 (19.5 to 41.1) | 38 | 54.6 (43.0 to 66.3) | 12 | 16.2 (7.6 to 24.9) |
| Sunderland | 186 | 59 | 31.6 (24.9 to 38.2) | 106 | 56.9 (49.8 to 64.0) | 30 | 16.3 (11.0 to 21.6) |
| Bath/Gloucester | 69 | 19 | 28.0 (17.3 to 38.6) | 25 | 36.3 (24.9 to 47.7) | 16 | 23.6 (13.5 to 33.6) |
| Oxford/Cambridge | 78 | 18 | 23.2 (13.8 to 32.6) | 39 | 49.9 (38.8 to 61.1) | 13 | 16.4 (8.1 to 24.6) |
| Southampton | 64 | 17 | 26.1 (15.4 to 36.9) | 27 | 43.3 (31.2 to 55.4) | 17 | 25.9 (15.2 to 36.6) |

*Weighted numbers are rounded; respondents could select multiple options; 43 respondents (after weighting) said they “did not know” whether they used sunbed in place with or without supervision or at home.

Strengths and limitations of study
The strength of both studies lies in their size and robust design. Although differences in data collection precluded a joint analysis, the studies were large enough to produce reliable estimates of the English (within 1%), regional (within 5%), and city (within 3%) prevalence of sunbed use by children. Data were collected in a robust manner in face to face interviews, with revalidation of at least 10% of participants to ensure the correct classification and answers to key questions. Bias in selection of the study populations is a potential weakness, but the random location sampling technique largely overcomes the usual flaws of quota sampling. We used the normal approximation to the binomial
distribution for the proportions, rather than the $t$ test because of the relatively large numbers in the groups. The design effect was assumed to be 1 in both studies because of the relatively small numbers of interviews undertaken each week; making significant clustering effects unlikely.

Comparison with other studies

Previous studies of sunbed use in UK children have been small or less geographically diverse, but it has previously been reported as being high in teenagers from Merseyside. International studies report similar effects of sex and age on sunbed use by children. Reports from parts of Europe and the United States suggest higher rates of use than in England, with 30% of Swedish and 24% of American adolescents using indoor tanning facilities, often frequently.

Conclusions and policy implications

Our study provides an accurate picture of sunbed use by children in England and highlights a considerable public health issue. Many sunbed salons are in fitness/leisure centres or tanning/beauty salons, spuriously associating them with beauty and health, rather than premature visible ageing effects and cancer.

With sunbeds often located at home, and with no national registration scheme for commercial outlets, it is unclear how many sunbeds there are in England or the rest of the UK. Nevertheless, the number of commercial outlets seems to be increasing, with many in locations such as video rental shops or nail bars that might be unstaffed; in a previous study, 45% of the devices used by children in the West Midlands were coin operated. Sunbed use was highest in Liverpool and Sunderland, and the density of salons is higher in the urban areas of northern England than in the south, with a strong correlation between the number of outlets and level of deprivation.

Legislation to control sunbeds is in place in Belgium, Finland, France, Norway, Portugal, Spain, Sweden, US, Australia, New Zealand, and Scotland and is planned for Wales. There is a need for legislation across the UK to mandate licensing and inspection of outlets, outlaw sunbed use by those aged under 18, ban coin operated or unstaffed outlets, and require licensed operators to provide information to adult users on the health risks of sunbeds so they can make informed decisions.

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Accepted: 3 January 2010