# Supplementary Information: Reassessing the Evidence for Universal School-age Bacillus Calmette Guerin (BCG) Vaccination in England and Wales

Sam Abbott, Hannah Christensen, Ellen Brooks-Pollock

## Model validation

The percentage of cases in the first year was fitted to the Sutherland et al. estimates using the least squares method, such that .

## 

Supplementary Table S1: Comparison of results published by Sutherland et al. vs. our recreated model. This table shows the total notifications including primary and secondary effects from ending the BCG schools scheme at various times in white adults aged 15-29 years old in England and Wales.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year of Ending Scheme | 1988 | | | 1993 | | | 1998 | | | 2003 | | | 2008 | | | 2013 | | |
| Original | Recreated | Difference | Original | Recreated | Difference | Original | Recreated | Difference | Original | Recreated | Difference | Original | Recreated | Difference | Original | Recreated | Difference |
| 1986 | 288 | 296 | 8 | 226 | 226 | 0 | 208 | 205 | -3 | 181 | 175 | -6 | 128 | 123 | -5 | 80 | 78 | -2 |
| 1991 | 288 | 296 | 8 | 165 | 166 | 1 | 130 | 131 | 1 | 128 | 126 | -2 | 115 | 111 | -4 | 80 | 78 | -2 |
| 1996 | 288 | 296 | 8 | 165 | 166 | 1 | 90 | 91 | 1 | 77 | 76 | -1 | 80 | 80 | 0 | 72 | 70 | -2 |

## Results

Supplementary Table S2: The median number (with the 2.5% and 97.% quantiles) of vaccines required to prevent a single case of Tuberculosis within 15 years in a ethnic White UK born adult vaccinated at 13 years old.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Year of Vaccination | 9% decrease (original parameters) | 9% decrease | 3.9% decrease | 1.9% decrease | 0% decrease | Notifications | Incidence Rates |
| 1969 | 460 | 460 (390 - 550) | 460 (390 - 550) | 460 (390 - 550) | 460 (390 - 550) | 460 (390 - 550) | 460 (390 - 550) |
| 1974 | 940 | 940 (780 - 1200) | 880 (730 - 1100) | 860 (710 - 1100) | 830 (680 - 1000) | 860 (710 - 1100) | 870 (640 - 1100) |
| 1979 | 1400 | 1400 (1100 - 1800) | 1100 (910 - 1400) | 1000 (820 - 1300) | 910 (740 - 1200) | 1000 (860 - 1300) | 1100 (660 - 1700) |
| 1984 | 2200 | 2300 (1800 - 2900) | 1400 (1100 - 1700) | 1100 (900 - 1400) | 910 (740 - 1200) | 1600 (1300 - 2000) | 1500 (730 - 2900) |
| 1989 | 3600 | 3600 (2900 - 4600) | 1700 (1300 - 2100) | 1200 (990 - 1500) | 910 (740 - 1200) | 1800 (1500 - 2300) | 1700 (760 - 4000) |
| 1994 | 5800 | 5800 (4700 - 7400) | 2000 (1600 - 2600) | 1300 (1100 - 1700) | 910 (740 - 1200) | 1700 (1400 - 2200) | 1600 (630 - 4200) |
| 1999 | 9300 | 9300 (7600 - 12000) | 2500 (2000 - 3100) | 1500 (1200 - 1900) | 910 (740 - 1200) | 1600 (1300 - 2000) | 1500 (510 - 4200) |
| 2004 | 15000 | 15000 (12000 - 19000) | 3000 (2500 - 3800) | 1600 (1300 - 2100) | 910 (740 - 1200) | 1400 (1100 - 1700) | 1500 (450 - 5000) |
| 2009 | 24000 | 24000 (19000 - 30000) | 3700 (3000 - 4600) | 1800 (1500 - 2300) | 910 (740 - 1200) | 1200 (960 - 1500) | 1200 (330 - 4300) |
| 2014 | 38000 | 38000 (31000 - 49000) | 4500 (3600 - 5700) | 2000 (1600 - 2500) | 910 (740 - 1200) | 1500 (1200 - 1900) | 1500 (370 - 6000) |
| 2019 | 61000 | 61000 (50000 - 78000) | 5400 (4500 - 6900) | 2200 (1800 - 2700) | 910 (740 - 1200) | 2200 (1800 - 2700) | 2300 (470 - 10000) |
| 2024 | 98000 | 98000 (80000 - 130000) | 6600 (5400 - 8400) | 2400 (1900 - 3000) | 910 (740 - 1200) | 3200 (2600 - 4100) | 3300 (530 - 18000) |

Supplementary Table S3: The median number (with the 2.5% and 97.% quantiles) of additional annual notifications due to ending the BCG schools’ scheme in selected years.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Year Ending Scheme | 9% decrease (original parameters) | 9% decrease | 3.9% decrease | 1.9% decrease | 0% decrease | Notifications | Incidence Rates |
| 1971 | 204 | 203 (162 - 247) | 391 (310 - 476) | 557 (440 - 678) | 827 (652 - 1009) | 531 (421 - 646) | 548 (273 - 1254) |
| 1976 | 158 | 157 (123 - 193) | 350 (276 - 428) | 525 (414 - 643) | 816 (642 - 998) | 497 (391 - 607) | 520 (236 - 1282) |
| 1981 | 97 | 97 (76 - 119) | 282 (223 - 346) | 462 (364 - 565) | 767 (604 - 938) | 434 (341 - 531) | 462 (181 - 1275) |
| 1986 | 61 | 61 (48 - 75) | 231 (182 - 283) | 410 (323 - 501) | 724 (570 - 886) | 406 (319 - 496) | 427 (151 - 1282) |
| 1991 | 43 | 43 (34 - 53) | 200 (158 - 245) | 378 (298 - 462) | 703 (554 - 859) | 399 (313 - 487) | 419 (138 - 1336) |
| 1996 | 30 | 30 (23 - 36) | 170 (134 - 208) | 341 (269 - 418) | 668 (526 - 817) | 384 (301 - 469) | 397 (122 - 1354) |
| 2001 | 20 | 20 (16 - 25) | 141 (111 - 173) | 302 (238 - 369) | 620 (489 - 758) | 359 (282 - 439) | 359 (102 - 1332) |
| 2006 | 14 | 14 (11 - 17) | 113 (89 - 139) | 255 (201 - 313) | 550 (433 - 673) | 311 (244 - 380) | 314 (84 - 1265) |
| 2011 | 9 | 9 (6 - 11) | 82 (64 - 102) | 196 (152 - 242) | 440 (343 - 542) | 215 (167 - 265) | 215 (51 - 1026) |
| 2016 | 5 | 5 (3 - 5) | 49 (35 - 63) | 120 (88 - 155) | 280 (205 - 358) | 109 (80 - 140) | 103 (15 - 755) |
| 2021 | 2 | 2 (1 - 3) | 20 (13 - 29) | 52 (33 - 74) | 126 (78 - 176) | 39 (24 - 54) | 41 (3 - 491) |