Head lice: Impact of COVID-19 and slow recovery of prevalence in Cambridgeshire, UK

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Following school closures and changes in contact behavior of children and adults a reduced head louse prevalence has been reported from across the globe. In parallel, sales of treatments were observed to fall, partly because of supply problems of some products following the pandemic, but this did not appear to result in more cases of infestation. Surveys of schools in and around Cambridge, UK, found that infestation rates were significantly reduced particularly in city schools compared with similar surveys conducted before the COVID-19 pandemic. Contrary to expectation the number of cases in schools has only risen slowly since schools returned to normal full time working in 2022-2023.

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16 **Abstract**

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19 louse prevalence has been reported from across the globe. In parallel, sales of treatments were

20 observed to fall, partly because of supply problems of some products following the pandemic, but

21 this did not appear to result in more cases of infestation. Surveys of schools in and around

22 Cambridge, UK, found that infestation rates were significantly reduced particularly in city

23 schools compared with similar surveys conducted before the Covid-19 pandemic. Contrary to

24 expectation the number of cases in schools has only risen slowly since schools returned to normal

25 full time working in 2022-2023.

26 **Introduction**
27

28 Head louse infestation in developed economies is principally found in children of primary school

29 age extending into the first few years of secondary schooling, the latter often from contact with

30 younger siblings. There are no data on transmissibility of head lice, but numerous point

31 prevalence surveys have been conducted worldwide that show evidence of links between factors

32 such as social crowding, forms of play, attendance at school, and out of school activities, with

33 presence and transmission of head lice.

34 Irrespective of the actual point of transmission of lice, the regular attendance of children at school

35 gives them the opportunity to encounter members of their peer group potentially carrying head

36 lice that can be passed on. Similarly, attendance at more social groupings such as sports clubs,

37 scout organizations, birthdays parties, sleep overs, and selfie photographs increase the chances of

38 acquiring head infestation. In addition, school holidays do not give respite from possible

39 exposure because they may be associated with public holidays where friends and family gather,

40 such as various winter and spring religious festivals, or family travels for vacations in the

41 summer months where children enter play schemes and encounter those of a similar age from a

42 variety of backgrounds and cultures.

43 These normal routines all became disrupted during the period from late 2019 through to mid-

44 2021 as a result of government interventions attempting to control the transmission of SARS-

45 CoV-2 (Covid-19) virus infection. This disruption included full lockdowns, school closures, and

46 a slow return to normal processes of life, with various levels of intensity for each country. In the

47 United Kingdom, some schools closed as early as late February 2020, with a nationwide

48 shutdown of education from 20 March for all students except children of key workers, and

49 vulnerable children. Although some schools started to reopen in June that year, the majority

50 remained closed until the start of the new academic year in September 2020. Following a

51 resurgence of virus transmission in December 2020 there was a further closure of schools from

52 early January through until the beginning of March 2021 (Wikipedia 2023).

53 Similar lockdown periods in other countries appear to have had an impact on transmission,

54 detection, and putatively the elimination of head lice, which have been indicated through changes

55 in the sales of head louse treatments in France, Israel, and in North Carolina, USA, (Launay et al.,

56 2022; Mumcuoglu et al., 2022; Bonanno et al., 2022) as well as responses to a questionnaire

57 distributed online in Buenos Aires, Argentina (Galassi et al., 2021). For this article we have

58 reviewed reported changes in sales figures of pediculicide products in the UK and Europe and

59 looked at the presence of lice in schools before and after Covid-19 by combing examinations of

60 children across whole schools.

61

Materials & Methods

63

Market data for head louse products

65

66 Sales data for the United Kingdom head louse market showing sales over 52-week periods from

67 April 2016 through to March 2023 were generated from the market research company IRI. Data

68 were originally obtained so that brands could be compared over time for market share. These

69 include all products under the same label, including pharmacy sales and dispensing of medical

70 products as well as pharmacy and supermarket sales of medical device products. Data showing

71 annual product sales changes in European Union countries for 2019 to 2022 were kindly provided

72 by Oystershell NV.

73 Data for prescribable medicines categorized by National Health Service geographic region of

74 England were obtained from the OpenPrescribing website (OpenPrescribing.net, 2023). These

75 show the number of prescriptions dispensed for each of the three head louse treatment medicinal

76 products in the UK (dimeticone 4% cutaneous lotion or spray, malathion 0.5% aqueous liquid,

77 permethrin 1% scalp application). Available searchable databases on the website include

78 individual GP practices, local NHS trusts, or regional NHS teams.

79

80 *School screening*

81

82 The Medical Entomology Centre has routinely worked with local schools throughout

83 Cambridgeshire, UK, since 2006. Schools with a perceived or confirmed head louse problem

84 have made contact on a regular basis to conduct whole school checks using dry detection

85 combing using PDC plastic combs (Zantey ApS, Værløse, Denmark) under a continuing approval

86 for combing and collecting lice granted by Huntingdon Research Ethics Committee (REC

87 reference Number 06/Q010640). Usually, at the beginning of each school year, interested

88 schools send a letter to parents/guardians requesting consent for children to be checked on one or

89 more occasions during the school year and to return a section of the letter if they do not wish their

90 child(ren) to be checked. Only a small number of children's parents have declined each year.

91 Children found to have lice are provided with a letter to take home and usually a voucher

92 redeemable at a supermarket pharmacy local to the school. When appropriate, an offer to take

93 part in a clinical investigation of a new treatment option is also given. Each voucher was valid

94 for any head louse treatment product of the parent's choice to the value of £10.00 (approximately

95 €12.00 /$12.00). This was generally sufficient to purchase one unit of some treatment products

96 or most of the cost of more expensive products. Such screening visits were conducted regularly

97 in several schools within a 30km radius of Cambridge from 2006 up until autumn 2019.

98 After schools' return to full time operation, and an expected recovery of head louse infestation in

99 autumn 2022, a series of schools in Cambridgeshire were contacted with an offer to visit and

100 screen the children in the same manner as previously.

101 **Results**

102 *Market data for products*

103

104 In the UK sales of head louse treatment products had been in some decline since the introduction

105 of physically acting products in 2006 and the withdrawal of several insecticide-based products.

106 This decline continued through to the early part of 2019, nearly a whole year before the outbreak

107 of Covid-19 (Figure 1). The sequence of sales reports showed that the number of units of the

108 main branded treatment products continued to decline during the period of the first lockdown.

109 For example, sales of Brand 1 reduced from 949,953 units to 774,310 (175,643 units or 18.5%)

110   and Brand 2 declined from 565,627 units to 389,863 (175,764 or 31.1%) between April 2019 and

111   April 2020. However, products that had previously held a smaller market share, including minor

112   brands, generics, and combs, increased their sales from 277,768 units to 1,283,760 over the same

113   period, an increase in turnover of 462.2%. Essentially the same trend for downward sales of the

114   main brands continued through to April 2021 with further losses of market share, with Brand 3

115   selling 191,794 (49.7%) fewer units (194,453 down from 386,247) and Brand 1 selling 432,772

116   (56.0%) units fewer (341,538 down from 774,310). For this year there was also a reduction in

117   the "Others" category to 716,035 units, a reduction of 44.2% relative to 2019-2020 but this share

118   was still more than 2.5 times higher than for 2018-2019 (Figure 1).

119   A similar pattern emerged for sales of pediculicides throughout Europe (Figure2) with a decline

120   in sales for most countries between the second quarters of 2019 and 2021, with a slight recovery

121   in most countries during 2022. Between 2019 and 2022 the lowest decline was only 9% in

122   Poland compared with the greatest decline of 59% in Italy. Overall, across the continental area

123   the decline between 2019 and 2022 was 42% after a 17% recovery between 2021 and 2022.

124   In the UK, prescribed pediculicide treatments now constitute only a small fraction of treatments

125   used since the changes of recommendations from the Department of Health (DoH) in the mid-

126   1990s (DoH, 1996), after which many general practitioners either chose not to prescribe

127   pediculicides or else strictly limited their prescriptions. However, three medicinal treatment

128   products are still available although only in a few of the Integrated Care Boards did the number

129   of prescriptions each month reach 100 for any of the treatments even before 2019 but, as with

130   over-the-counter sales of treatment products, there was generally a trend for a decline in

131   prescribing between 2020 and 2022 (Figure 3).

132   *School screening*

133

134   During the lockdown periods the number of children in schools was only a fraction of normal,

135   and varied considerably depending upon the location and the socio-economic structure of the

136   communities they served. For example, in one local school between 80 and 100 children (20-

137   25% of the school roll) still attended because their parents were mostly key workers whereas

138   another school close by was only attended by children considered vulnerable or at risk, about the

139   2% of the roll. Despite government recommendations for "social distancing" it was clear that

140   this meant little to primary school children and playground observations showed that most

141   children played with as much contact as usual, which theoretically could have permitted normal

142   levels of head louse transmission.

143   During the spring of 2022 we attempted to start recruitment for a clinical investigation of a head

144   louse treatment using our normal method of advertising on local radio stations. The response was

145   lower than expected compared with previous recruitment campaigns and suggested that perhaps

146   the incidence of head louse infestation had not returned to normal.

147   By early September 2022, the beginning of the autumn term, it was expected that children

148   playing together over the summer holiday would have enabled transmission of lice but, after

149   contacting more than 30 of the schools previously visited, only four requested a visit. Some

150   schools responded to follow up telephone calls by stating that they did not currently have a

151   problem, so concluded because they were not receiving complaints about lice from parents. Of

152   the four schools that did request a screening visit, schools B, F, G, and H, School B had been

153   regularly visited previously since the mid-1990s (Burgess 2023) and was considered a benchmark

154   for the prevalence of lice in local communities. The combing examinations found highly

155   significant differences (p<0.001) in the levels of infestation for the two larger urban schools (B

156   and H) compared with pre-Covid levels, shown in Table 1, but a non-significant reduction in city

157   School G, which also had a considerably diminished school roll compared with previous visits.

158   The rural School F was effectively unchanged from previous visits, mainly because of families

159   with more than one child having lice together.

160   In January of 2023 it was expected that louse prevalence may have increased following family

161   social gatherings during the winter holiday period. Rural School J was only marginally different

162   from previous visits and, in early February, city School K, which also had a smaller school roll

163   than on previous visits, appeared to indicate a slight recovery of lice in that community (Table 1).

164   However, visits to a village school (P) and two city schools (Q and R) over the next 5 weeks

165   showed that any "recovery" in louse transmission that had been observed in School K was highly

166   local (Table 1).

167   A proportionately higher prevalence of 3.02% was found in May 2023, after the spring school

168   holiday, in the urban School S, which had not been previously visited. A second visit to School

169   K found no significant difference (p = 0.846) from February whereas in School B, visited 1 day

170   later, there was a significantly (p = 0.0278) increased prevalence compared with the previous

171   October. However, this prevalence of 2.89% was still significantly (p = 0.0028) lower than

172   before the Covid pandemic (Table 1).

173   **Discussion**

174

175   From 2006 through to 2018 we found consistent levels of infestation when screening for head lice

176   in primary schools throughout Cambridgeshire, Huntingdonshire, and adjacent areas. The most

177   recent series of visits pre-Covid in 19 schools found 387/7169 (5.4%) of students had lice, with a

178   range across both rural and city schools of 1.35% - 13.04% infestation, which was essentially

179   similar to surveys conducted in the mid-1990s (Burgess, 2023). During this period, each child

180   found to have lice was issued with a head louse treatment voucher but the number of vouchers

181   returned by the pharmacies was consistently lower than the number issued and rarely exceeded

182   50% of those sent out from any of the schools, which suggests that either the parents chose not to

183   purchase a treatment for their children or else chose alternative approaches to purchasing a

184   product. As a result, head louse infestation, and presumably transmission, would have continued

185   throughout each school year in many of the schools, as found previously (Burgess, 2023).

186   In this studies series of school screening visits, we have found that fewer students are attending

187   the majority of schools we visited. This reduction in school rolls is partly a reflection of a

188   declining birth rate both in the local area and nationally from 2010 through to 2021, with a 14%

189   drop in Cambridge over the past decade (ONS, 2023; CfS, 2023). This has been compounded by

190   persistent absence by some students grossed up to about 25% of students during the autumn term

191   of 2022 (Thompson, 2023). Although persistent absence is reportedly more likely for

192   disadvantaged students, we saw no evidence that this may have contributed to lower detected

193   rates of infestation. Cambridge has long had a different demography from the surrounding areas

194   with a relatively cosmopolitan population. This series of school visits found that in the city, as

195   opposed to surrounding villages, approximately half the students have family names that are not

196   historically British in origin and reflect the current ethnic demographic. Cambridge currently has

197   a population of which approximately 53% identify as white British (Census, 2021) and has the

198   highest non-British European population of any place outside the inner London boroughs at

199   around 20% (Census 2021).

200   It could be postulated that households from different cultures have a different attitude to vigilance

201   and management of head louse infestation for a variety of reasons so that the children who catch

202   lice are diagnosed within the home and the infestation eliminated at an early stage. Such attitudes

203   differ from those of some ethnic British households where lice can be found repeatedly on the

204   children (Burgess 2023; Burgess & Brunton 2023) and from some of whom we have in the past

205   heard comments such a "They should do something about it (lice)", the "They" being some

206   unnamed and unidentifiable public authority, and which is presumably a hangover from the

207   former practice of the school nursing services to supply pediculicides and to treat children, a

208   practice discontinued over 30 years ago.

209   The impact of Covid-19 on levels of head louse infestation in other countries had until recently

210   only been evaluated by comparisons of treatment product sales figures (Launay et al., 2022;

211   Mumcuoglu et al., 2022; Bonanno et al., 2022), questionnaire survey (Galassi et al., 2021), or

212   monitoring of online searches in the UK for information on head lice (Walker & Sulyok, 2023)

213   and not by physical screening of children. However, one recent study in Poland has compared

214   pre- and post-Covid levels of head louse infestation in schools and kindergartens. Although the

215   data from 28 schools and 64 kindergartens were merged as groups for analytical purposes, and

216   cover ages 3-14, it appeared that there was a significant reduction of infestation post-Covid in

217   both schools ($p = 0.0001$) and in kindergartens ($p = 0.0435$) (Padzik et al., 2023).

218   The figures we have cited from market research are confirmatory of the work of others but in

219   addition we have been able to restart a school screening program that has provided additional

220   confirmation of reduced levels of infestation, which would account for some diminished demand

221   for treatment products. In contrast, anecdotal reporting in some public press media have

222   suggested conflicting outcomes for head louse infestation as a result of the pandemic with parents

223   in the UK (Roberts, 2021) and a commercial louse treatment service in the USA reporting just as

224   many incidents of infestation as usual (NBC News, 2022). However, these may be the result of

225   parent carers spending more time looking for lice and then doing something about them. There

226   are also signs within the recent sales data that the return to more normal activities after the

227   lockdown periods have resulted in either an increased incidence of head louse infestation in some

228   areas, or at least an increased awareness of parents to look for the possibility that their children

229   might contract a louse infestation.

230   An additional observation made during the period before a return to normal activity was that in

231   many of the supermarkets and pharmacies in our locality the stocks of main brand head louse

232   treatment products were reduced, with some products missing from shelves for several weeks at a

233   time. Enquiries with manufacturers revealed that for some products there were supply chain

234   issues that had resulted in reduced deliveries, which in turn would have resulted in lower sales

235   figures across the industry. Under normal circumstances a reduction in availability of

236   mainstream treatment products might have been expected to result in an increase in prevalence

237   across the population if transmission of head lice was occurring at a normal rate. The fact that

238   children in the schools we have visited have mostly shown a lower than normal point prevalence

239   indicates that the transmission rate has been generally lower, either because prevalence was

240   reduced to a minimal level at some point during the Covid-19 pandemic or else, once children

241   were cleared of their lice, there were either sufficient changes in their contact behaviors that lice

242   were not able to find new hosts or else natural louse transmission rates are actually much slower

243   than people have historically perceived them to be.

244   Of these two possible reasons for continued low prevalence the more likely is that the louse

245   population was reduced to historically low levels during the 2019-2021 period and has not had

246   the opportunity to recover. In the past we have routinely postulated that where children have

247   regular social contact and prolonged periods of close play (Burgess, 1995), particularly for girls,

248   lice would spread throughout the social group so that no one individual would have a heavy

249   population of lice. In contrast, where individuals are isolated and unable to pass on their lice, we

250   have found heavy infestations on those people (Burgess, 2023; Burgess, Brown & Lee, 2005).

251

252   **Conclusions**

253   Reports from elsewhere have indicated that transmission of head lice among school children was

254   reduced during the Covid-19 pandemic because of school closures and social distancing. During

255   this period and following it, the sales of head louse treatment products were considerably reduced

256   in both the United Kingdom and European Union, with only a slow recovery up until early 2023.

257   We were able to confirm that the prevalence of head louse infestation in primary school aged

258   children in Cambridge, UK, had been reduced following the pandemic by conducting detection

259   combing visits to schools. The numbers of infestations found in 2022-23 was significantly

260   reduced in most schools compared with visits to the same schools performed before 2019 and,

261   although an increase in the number of cases was detected in a benchmark school between October

262   2022 and June 2023, the level of infestation was still significantly lower than before the Covid

263   pandemic, indicating that the spread of lice in a school community is considerably slower than

264   commonly believed.

265

266   **Acknowledgements**

267   We wish to thank the staff of all the schools visited during the course of this study for their

268   assistance during the combing screening visits. Data on sales of head louse treatment products in

269   the United Kingdom were kindly supplied by Thornton & Ross Ltd, Huddersfield, UK, and data

270   on sales in the European Union by Oystershell NV, Merelbeke, Belgium.

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339

Presence of head lice in Cambridgeshire primary schools from October 2022 to June 2023 compared with pre-Covid prevalence in the same schools.

A statistical comparison was made between post-Covid and pre-Covid infestations using a 2-sided Fisher Exact Test calculator available at

https://www.socscistatistics.com/tests/fisher/default2.aspx

School	Inspection for lice autumn 2022			Pre-covid inspection for lice			p-value
	Number of students			Number of students			
	Total	With lice	Percentage	Total	With lice	Percentage	
B Oct 3	420	3	0.71%	425	33	7.76%	<0.001
F Oct 12	99	6	6.06%	112	6	5.36%	1.00
G Oct 18	188	4	2.13%	305	15	4.92%	0.150
H Nov 29	320	5	1.56%	318	32	10.06%	<0.001
J Jan 30	97	2	2.06%	105	4	3.81%	0.684
K Feb 6	302	13	4.31%	540	31	5.74%	0.422
P Feb 22	297	5	1.68%	-	-	-	n/a
Q Mar 3	327	3	0.92%	345	24	6.96%	<0.001
R Mar 13	355	3	0.85%	432	16	3.70%	0.0095
S May 22	398	12	3.02%	-	-	-	n/a
K Jun 7	297	14	4.71%	540	31	5.74%	0.632
B Jun 8	381	11	2.89%	425	33	7.76%	0.0028

Figure 1

UK Sales of head louse treatment products April 2016 to March 2023

Each column shows the numbers of units of product sold for each of the four major brands, numbered "Brand 1" to "Brand 4", and the collective sales for minor brands, generics, and combs, shown as "Others"
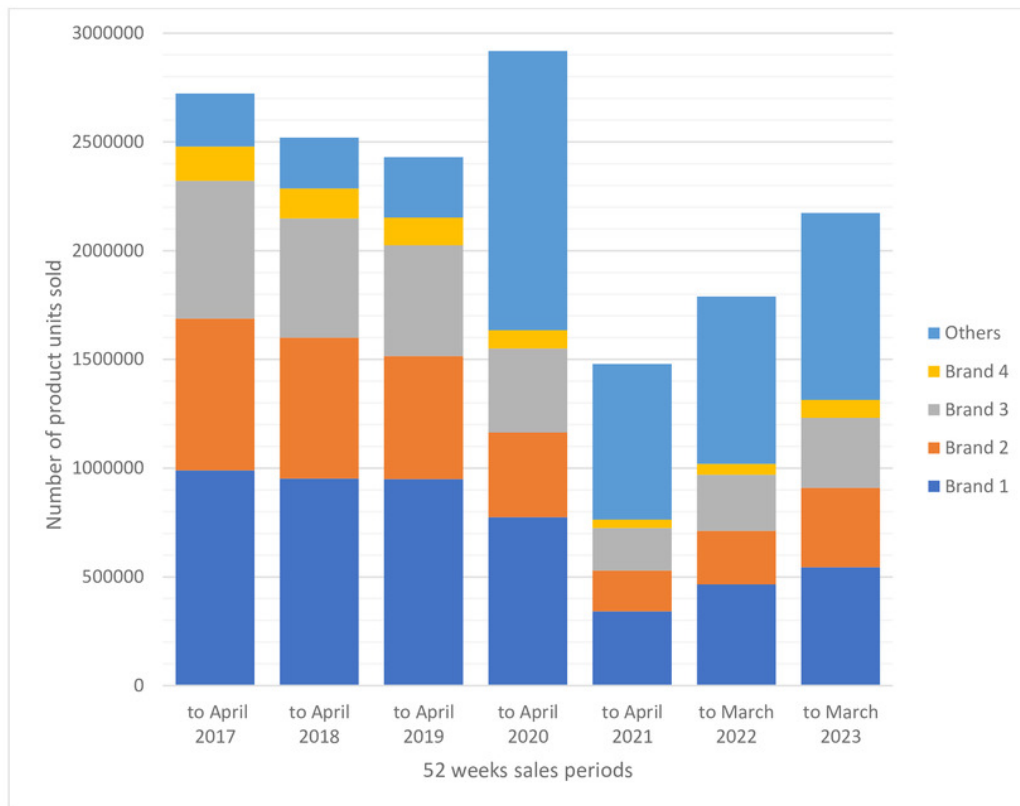
Figure 2

Sales of head louse treatment products in the European Union from June 2019 through to June 2022.

The columns show the relative numbers of units of product sold and the percentage change year on year.
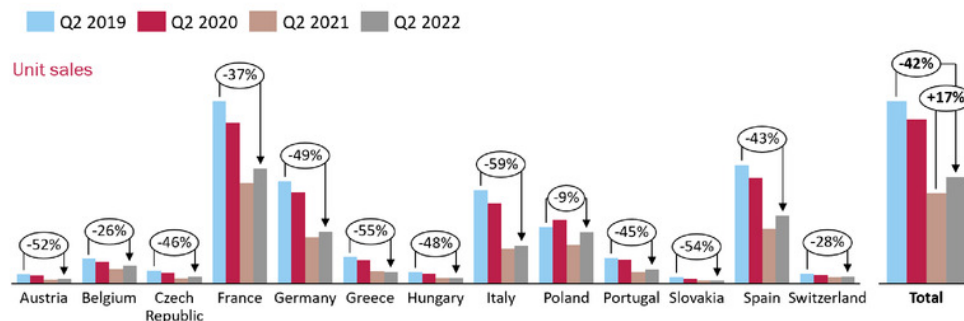
Figure 3

NHS prescribing of insecticide products for head lice by geographic region 2018-June 2023.

Each colored line represents the prescribing in one National health Service region, however, the colors used for each region by the online graphic generator are not consistent from one product type to another, e.g. the line for the East of England region is dark blue for dimeticone (parasiticidal) and dark green for malathion 0.5%.

Note: the prescribing line of malathion 0.5% also includes prescriptions for scabies treatment.

Periods of lockdown during the Covid-19 pandemic are shown by vertical bands of light orange color.