Modelling the impact of active travel school interventions in Scotland

Technical report

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To find out more, please contact: monitoring@sustrans.org.uk

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Author(s):	Eszter Tarcsafalvi
Reviewed by:	Matthew Pearce, Chloe Randall
Signed off by:	Lisa Gallacher

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Introduction

This technical report accompanies the 'Modelling the impact of active travel school interventions in Scotland' report, published in January 2024.

Here we discuss the limitations of the analysis, present an alternative modelling approach, and break down the findings by mode. Finally, we share the additional methodology notes for the analysis undertaken.

Limitations

This analysis aims to demonstrate the impact of active travel interventions on school travel and show the scale of potential impact when interventions are reduced or increased at a national level. However, the specific rates and values included in the report have been based on various assumptions and available data[1] and care should be taken when interpreting the specifics of the findings. Apart from these specific notes, the following over-arching limitations should also be considered.

By applying the change values derived from the group of schools with interventions to all schools, we assume that the differences observed are directly due to the interventions and that no other factors would cause the non-intervention group to develop different travel patterns to the intervention group. The same assumptions are made when applying the change values from the non-intervention schools to all schools.

We also assume that there is no lower or higher 'cap' to the proportion of pupils travelling actively or by car, or at least that these caps will not be reached at the rates estimated in this analysis. In practice, factors unrelated to interventions, such as distance to school or access to cycles, might mean that the existence of interventions in themselves will not be able to change everyone's behaviour. Similarly, lack of access to cars would mean that a proportion of pupils will not be able to travel by car, even if they wanted to.

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[1] See the Methodology notes section for further detail.

Finally, the time period covered in this analysis includes the Covid-19 pandemic, when travel patterns overall and travel to school specifically have been significantly different to previous years. This was a particular concern when using forecasting to estimate future mode share levels (2022 to 2026), as the linear regression model used is particularly sensitive to atypical or ‘outlier’ values.

While we do include travel data from the pandemic period in the overall results presented in the report, we have disregarded data from 2020 from the forecasting model specifically, in order to remove the effect these outlier values would have had on the forecasted figures. 2021 data, which shows a rebound towards previous values but is still notably different from the previous patterns, has been retained in this analysis, thus acknowledging the potential longer-term effects of the pandemic on travel patterns.

However, we also ran the forecasting exercise with 2020 data included in the linear regression model and found that while there were some slight differences in the actual values predicted through the forecasting, the differences between the 3 scenarios were very similar in the two sets of forecasts. Overall, these results strengthen our findings around the impact of interventions, regardless of the exact mode share values predicted over these five years.

Additionally, while the analysis included in this report focused on modelling changes in overall active travel rates and car travel rates to school, we have also calculated values for walking (including scootering) and cycling levels separately. It should be noted that while findings for overall active travel were similar with the two methodologies, for cycling specifically the choice of the two methodologies did, in fact, have a notable impact on the results. The next section of this report includes findings by mode, as calculated using both methodologies, and discusses some of the key implications of these results.

Alternative methodology and results by mode

As described in the Limitations section, we have considered two alternative methodologies for the forecasting part of the analysis, on account of the unusual travel patterns observed in 2020, during the Covid-19 pandemic. The primary approach, which resulted in the findings included in the main report, excluded 2020 HUSS data from the calculations used to forecast mode share between 2022 and 2026; the alternative approach included data from 2020 in the forecasting.

In this section, we share and compare the results from both approaches reflecting on any notable differences. Additionally, we also present the modelled scenarios for walking & scooting and cycling individually.

Active travel (overall) and car travel

Figure 1a below shows the actual and modelled active travel rates, including future forecasting, based on the primary methodology used in this report (ie disregarding the 2020 data in the forecasting calculations). Figure 1b shows the same calculations with the alternative approach, which included the 2020 data when estimating the future rates.

While there are some slight differences in the results – most notably, the primary approach predicts slightly declining active travel rates over these five years if business-as-usual continues while the alternative approach shows a slight increase, the *differences between the various scenarios,* which show the estimated impact of the intervention delivery, are very similar with both methodologies. The overall message remains unchanged regardless of the methodology: more intervention delivery results in a bigger year on year increase in active travel rates, while a lack of interventions would likely lead to declining rates.

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Figure 1a: Active travel forecast, primary methodology

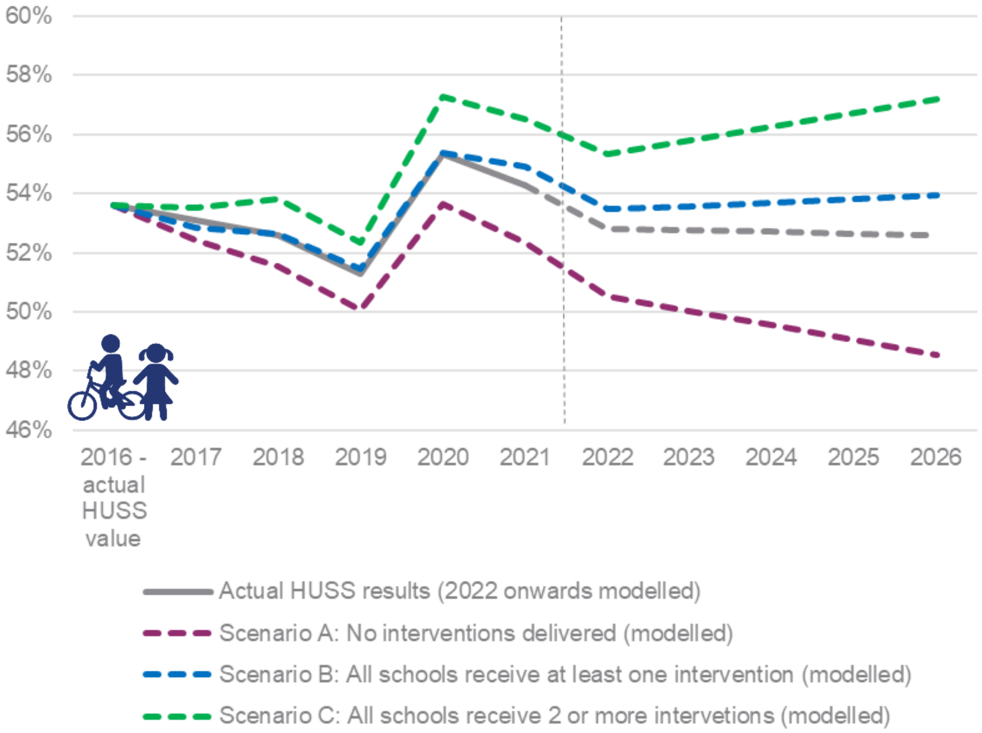
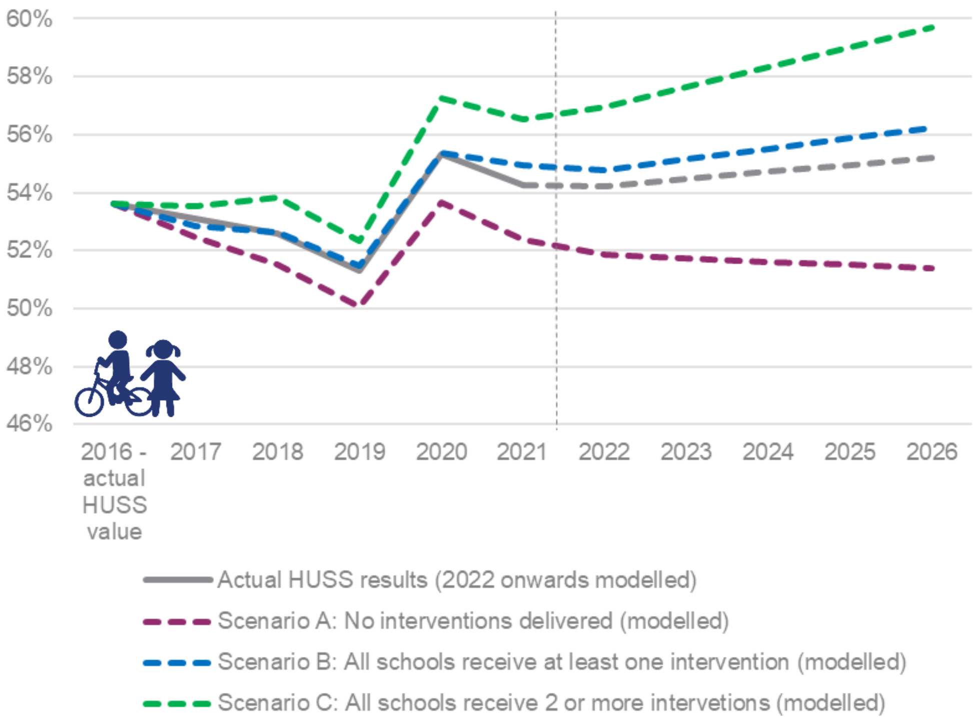


Figure 1b: Active travel forecast, alternative methodology



These results are mirrored when looking at car travel rates, and as with active travel overall, the two methodologies yield similar findings.

Walking and scooting

Findings for walking and scooting specifically are similar to those for the overall active travel rates. This is not surprising, as we know that the most common form of active travel to school is walking (in 2021 44.8% of primary pupils walked to school and 5.3% cycled[2]).

The difference between the two methodologies is slightly more notable in the case of walking and scooting rates, compared to active travel overall. For example, while both approaches predict walking & cycling rates to increase in Scenario C, the primary approach estimates that the proportion of those walking and scooting will be 50.8% by 2026, while the equivalent estimate using the alternative approach is higher, at 54.8%.

However, while the specific values might vary depending on the approach used, the differences between the scenarios, ie the estimated impact of interventions, are consistent regardless of the approach. For example, the difference between the Scenario A and the business-as-usual prediction for 2026 is virtually identical, with 3.4 percentage points difference with the primary approach and 3.3 when using the alternative methodology. (See Figures 2a and 2b.)

[2] Source: Hands Up Scotland Survey '2022 National Results' document. Accessible from: https://www.sustrans.org.uk/our-blog/projects/uk-wide/scotland/hands-up-scotland-survey

Figure 2a: Walking & scooting forecast, primary methodology

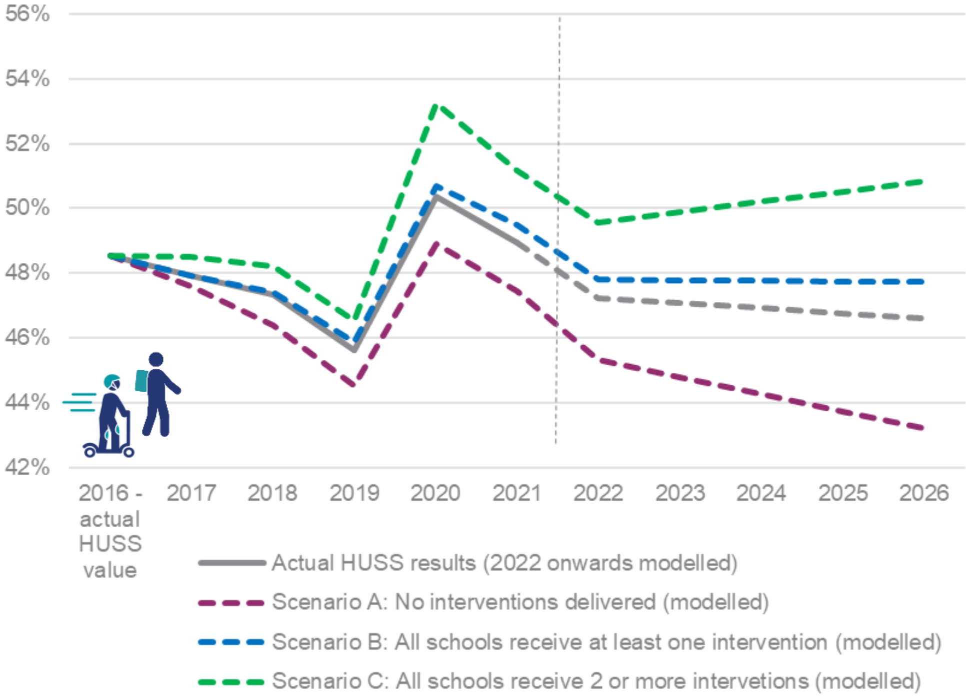
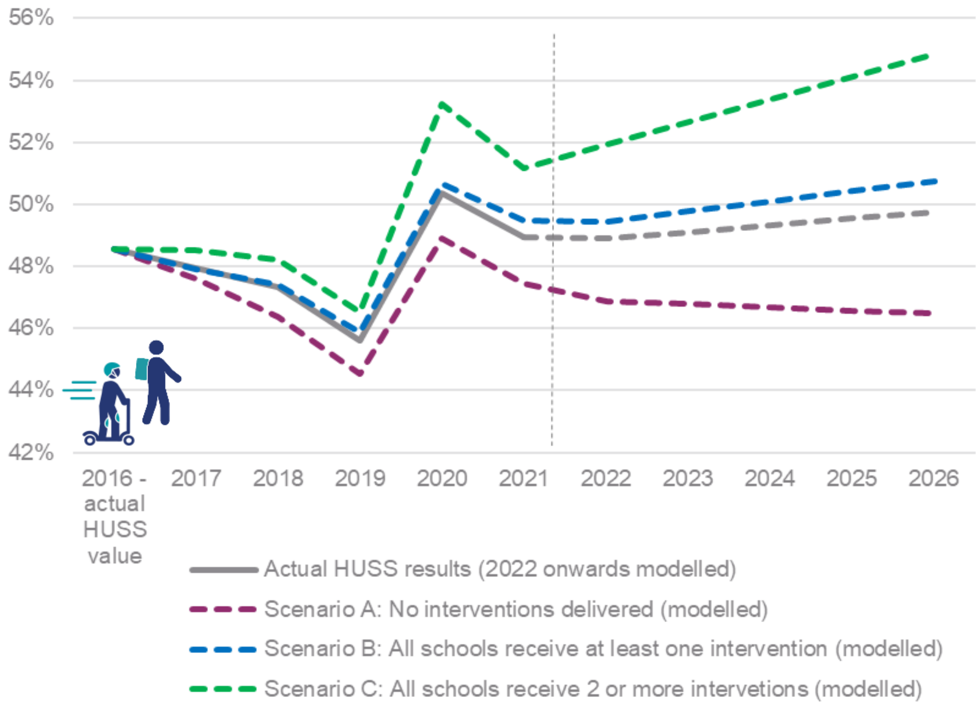


Figure 2b: Walking & scooting forecast, alternative methodology



Cycling

Unlike the other modes discussed above, the choice of forecasting methodology has a notable effect on the findings related to levels of cycling.

The primary forecasting approach used (which disregards the lower-than-average cycling figures from 2020 in the calculations) shows a positive relationship between intervention delivery and cycling levels. This is consistent with the findings from the other modes presented above. The results suggest that national cycling levels would be highest if all schools had two or more interventions (Scenario C), standing at 6.3% in 2026, compared to 6% if business-as-usual is maintained, and 5.7% if no schools had interventions (Scenario A). (See Figure 3a.)

On the other hand, using the alternative forecasting approach, ie including the 2020 data in the calculations used for the forecast, shows a very different picture. With this approach, Scenario C would see a *lower* rate of cycling over ten years than both the business-as-usual prediction and the scenario where no interventions are delivered (Scenario A). (See Figure 3b.)

We have noted above that a key limitation of the simple regression modelling used to forecast the future results is its sensitivity to outlier values. While 2020 data can be considered an outlier across the board, this is particularly the case for cycling; we can see from Figures 3a and 3b that cycling rates saw an uncharacteristic dip in 2020, with the largest drop observed in schools that had multiple interventions.

We can only theorise about the reasons for these unusual cycling numbers in 2020. We know that many interventions were cancelled or curtailed that year, with Bikeability and Big Pedal, both cycling focused interventions, heavily impacted. In some cases delivery was limited or had to be cut short due to the pandemic, which may have meant that these interventions were not actually able to deliver the cycling focused impact they otherwise would have in this particular year. In other cases, interventions were not able to be rolled out in all schools that were due to take part or had to be cancelled completely (as in the case of Big Pedal). Due to these cancelled interventions, the number of schools with 2 or more interventions was also much smaller in 2020 than in previous years (88 in 2019-20 academic year, compared to an average of 226 in other years), which means a smaller sample for the analysis, reducing the reliability of these findings overall. Finally, it is also likely that some children switched from cycling to walking this year, perhaps as a result of their parents' or carers' lack of commutes in this period (due to furlough and working from home).

Regardless of the exact reasons behind the unusual cycling numbers in 2020, this one-off significant dip in the proportion of children cycling in schools with interventions had a strong effect on the forecasted values for 2022 to 2026 using the alternative approach, ie including these 2020 values in the model. Seeing that cycling numbers in these schools have bounced back in 2021, we feel that using our primary forecasting approach, excluding 2020 from the calculations, remains the more appropriate methodology across the analysis and for modelling cycling levels. For comparison, we have included both sets of results below.

Figure 3a: Cycling forecast, primary methodology

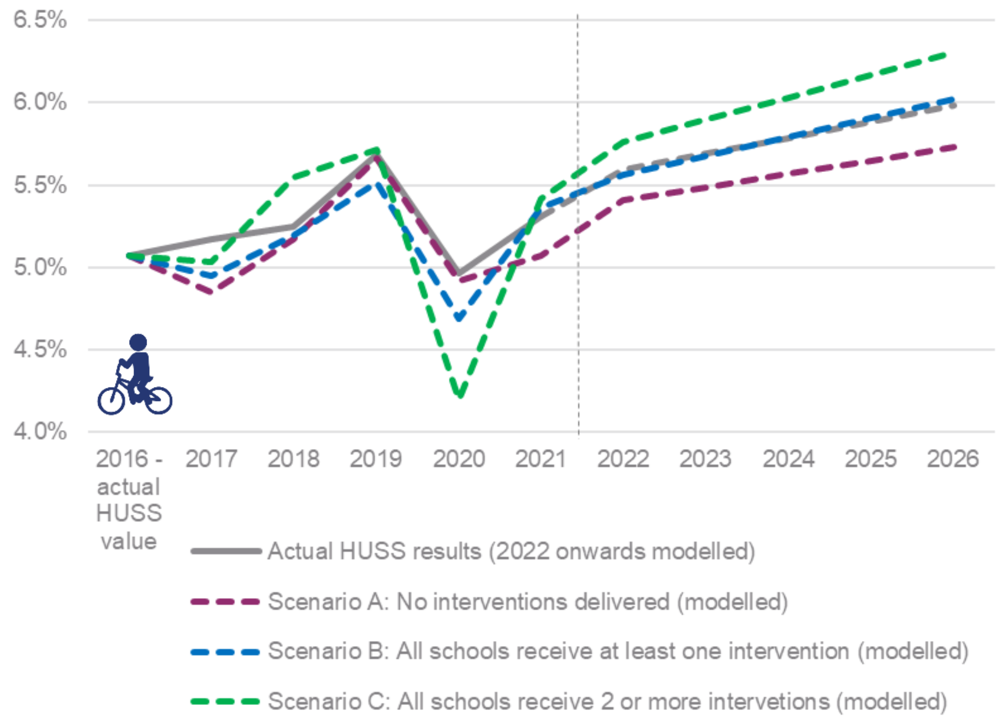
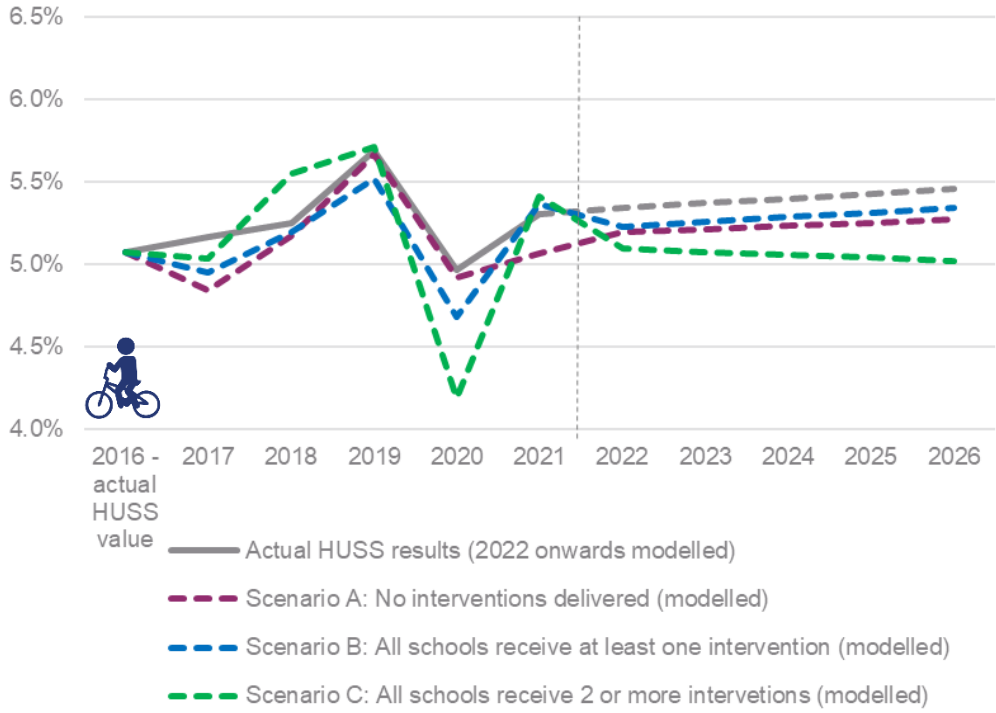


Figure 3b: Cycling forecast, alternative methodology



Methodology notes

The following methodology notes and assumptions should be noted:

- The dataset used for the analysis does not include information on schools in Clackmannanshire, as this was not available at the time of the analysis.
- The 'actual' travel values used for comparison come from the national HUSS results[3], and they relate to all primary schools that have participated in HUSS in a particular year. This group of schools is slightly different from the group that have been used to calculate the rate of *year-on-year change* for the purposes of modelling Scenarios A, B and C. These change rates could only be calculated from schools that have participated in HUSS *two years in a row* (additionally, these calculations also exclude Clackmannanshire, as above, while the 'actual' values include all council areas). This difference in the groups introduces a slight variance in the results, estimated at around 0.1 percentage point a year.
- The rates of year-on-year change used to model Scenarios A, B and C, as well as the 'actual' values are based only on schools that have participated in HUSS (and with the additional restrictions detailed above). However, since around 80% of all primary schools in Scotland take part in HUSS each year, we have assumed these rates to be representative of all schools in the country. Additional results about numbers of children, trips, and carbon emissions are calculated based on all the primary schools in Scotland, not just the ones with HUSS data.
- When modelling the scenario where all schools had interventions, we assumed that the distribution of interventions would be proportional to the actual distribution of interventions observed in schools, excluding schools with no interventions. A similar assumption has been made for the scenario where all schools had two or more interventions.
- The 2022 to 2026 forecasting has been done using the FORECAST.LINEAR function in Microsoft Excel.
- All results relating to the *number* of school children have been calculated based on the 2021 Scottish school roll[4].

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[3] Source: Hands Up Scotland Survey '2022 National Results'. Accessible from: https://www.sustrans.org.uk/our-blog/projects/uk-wide/scotland/hands-up-scotland-survey

[4] Source: https://www.gov.scot/publications/summary-statistics-schools-scotland/

- Calculating the number of additional car trips a year assumes an average of 1.7 children travelling in each car[5], 190 days in a school year[6] with an average of 11.4 days absence a year[7], and 4 journeys a day (to and from school at pick-up and drop-off).
- Calculating the vehicle emission savings assumes an average 1.6 mile (2.6 kilometre) trip to or from school[8]. Emission rates have been estimated using the UK government greenhouse gas conversion factor for an average car of unknown fuel in 2023.[9]

[5] This has been estimated based on average number of dependent children in the UK in 2022. Source for average number of dependent children: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2022

[6] Source: https://researchbriefings.files.parliament.uk/documents/SN07148/SN07148.pdf

[7] Based on 2021 Scottish school attendance and absence statistics, sourced from: https://www.gov.scot/publications/school-attendance-and-absence-statistics/

[8] Based on the 2014 UK National Travel Survey, results sourced from: https://assets.publishing.service.gov.uk/media/5a8040f240f0b623026926cd/travel-to-school.pdf

[9] Source: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023