

# Active travel to school for children in Wales: A data linkage project and exploratory analysis

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**Date:** October 2025

## Background

Active travel to school (ATS)—defined as walking, cycling or wheeling as a means of transport to get to a particular destination for everyday journeys<sup>1,2</sup>—has well-documented health benefits, including a reduced risk of obesity, improved cardiovascular function, and enhanced mental wellbeing<sup>3,4</sup>. Despite these benefits, recent trends show a steady decline in ATS, with increasing reliance on passive modes such as car travel<sup>5-7</sup>. Understanding the demographic, socio-economic, geographical, and school-related determinants of travel behaviours is critical for designing evidence-informed policies to promote sustainable travel to school.

Internationally, Wales was the first country to legislate for active travel through the Active Travel (Wales) Act 2013<sup>8</sup>. The act mandates Local Authorities (LAs) to map, plan, and deliver infrastructure improvements for walking and cycling. It also requires both the Welsh Government and LAs to actively promote active travel as part of their statutory duties. However, more than a decade since the Active Travel Act has passed and yet national active travel rates have not shown a corresponding increase, despite additional funding allocations. In 2022, an expert panel convened by the Senedd's Cross-Party Group on Active Travel concluded that although the act "has so much to offer Wales", its potential remains under-realised. The panel issued 51 recommendations<sup>7</sup>, including a restructuring of the Active Travel Board, enhanced monitoring mechanisms, and a national culture change campaign. The panel also identified increasing active travel to school as a policy priority, reflecting a growing interest among both researchers and decision-makers in understanding how to shift school travel behaviours.

This Data Insight aims to examine patterns of ATS in children aged 11-16 in Wales, using individual-level demographic data linked with geospatial distance to school data and school-level characteristics. The analysis is based on the Student Health and Wellbeing survey (SHWS), administered by the School Health Research

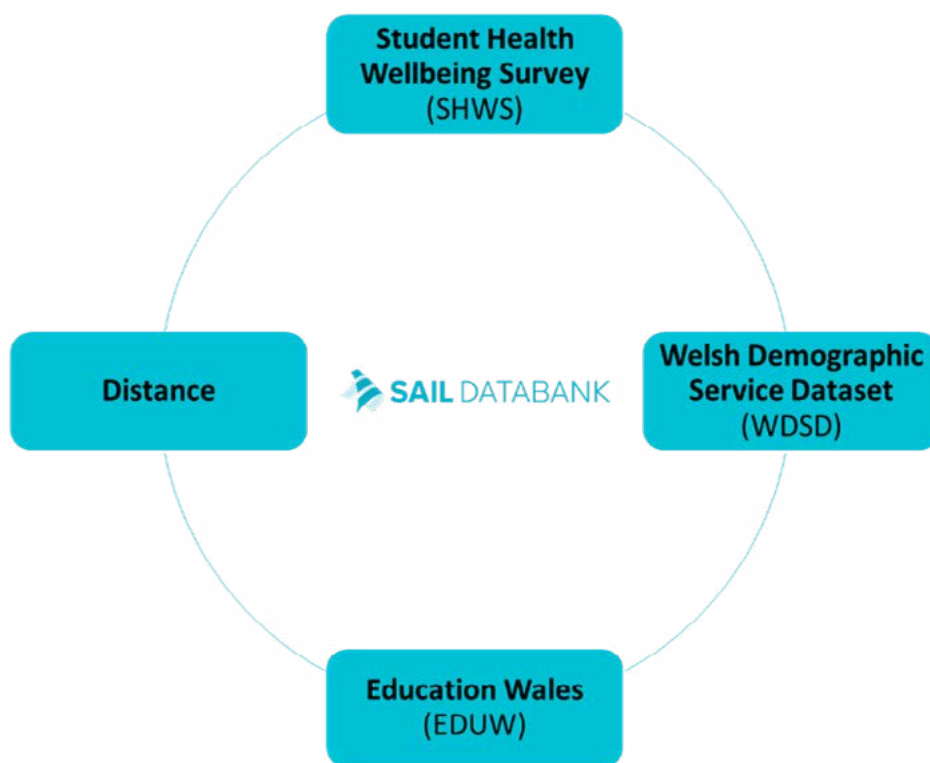
This Data Insight has been produced by the ADR Wales Climate Change research team. It provides a snapshot of informative research currently underway at ADR Wales but is not intended to provide a complete picture of the work undertaken within this field or the ADR Wales programme of work. Findings reported here will update the research and policy community and provide evidence to direct further analysis. More complex statistical analysis is required before sufficiently robust evidence can be provided to inform policy decisions; this more complex analysis will be completed and published in a later report. All findings should therefore be considered both provisional and indicative and may be subject to revision following more detailed checking and analysis. The information presented in this Data Insight has been reviewed by ADR Wales colleagues with expertise within this thematic area and is accepted to be accurate at the point of publication. Views expressed in this Data Insight are those of the researchers and not necessarily those of ADR Wales partner organisations.

Network (SHRN), and is linked to geospatial distance to school data in the Secure Anonymised Information Linkage (SAIL) Databank. The primary aim is to assess the usability of linked survey and geospatial data to identify behavioural trends associated with ATS in children, that can inform future active travel research in Wales and support Welsh Government policy.

## What we did?

The study employed a multi-source data linkage approach to analyse children’s active travel to school patterns (Fig 1). Self-reported data were obtained from the 2019 SHWS dataset, administered bi-annually to school children aged 11–16 across all maintained secondary schools in Wales. The SHWS dataset is an electronic, self-completion survey covering a wide range of topics including mental health, physical activity, risk behaviours, and school and family environments. Since 2017, all maintained secondary schools in Wales have been members of SHRN and eligible to participate. In 2019, 198 schools (94% of eligible institutions) contributed to the SHWS dataset. Details on sampling methodology and survey procedures are described elsewhere<sup>9</sup>.

*Figure 1 - Data sources linked to explore children’s travel to school patterns in Wales, UK*



A key component of the study involved calculating the distance children travelled to school from their home address. This was accomplished through geospatial techniques and network distance calculations. Specifically, shortest network distances were generated for all schools within a 50km radius of each home (captured by a Unique Property Reference Number (UPRN)) in Wales. SAIL’s split-file approach was used to anonymise the distances between schools and UPRNs and upload to SAIL<sup>10</sup>. The Education Wales (EDUW) and Welsh Demographic Service datasets (WDSD) were then used to anonymously identify the shortest network distance relevant to each student, based on their anonymised address and school in SAIL (this methodology

<sup>1</sup> This means they are overseen, or ‘maintained’, by the Local Authority. These schools must follow the national curriculum and national teacher pay and conditions (<https://law.gov.wales/schools-maintained-local-authorities>)

is discussed in further detail in a separate Data Insight). Further student and school data were obtained from EDUW and WDS datasets including school characteristics (e.g., medium language and whether the school is a faith school). The final dataset consisted of the linked distance, student and school data.

## What we found?

### Samples composition and representativeness

While the original SHWS consists of 198 schools with a total of 119,338 students, due to consent requirements (i.e., consent was required at three levels: school, parent, and student) the analytical sample used in this study was reduced significantly, to 32,558 students, representing around a quarter of responses. We further restricted the sample to those in year groups 7-11 (which included 11-16 years old children), those matched on all identifiers or with more than 90% probabilistic matching and valid and unique Residential Anonymised Linkage Field (RALF)<sup>11</sup>. Therefore, our final sample (SAIL-SHWS) consisted of 153 schools and 24,654 11-16-year-olds.

Due to the reduction of the original sample, we explored our final cohort in terms of differences or any biases that may have been introduced. Exploratory analysis demonstrated that the SAIL-SHWS sample exhibit similar characteristics and trends with the original SHWS (Figures 2-4).

**Figure 2 - Percentage distribution of respondent's sex (2.2% missing or "neither describes me" for the SHRN data set)**

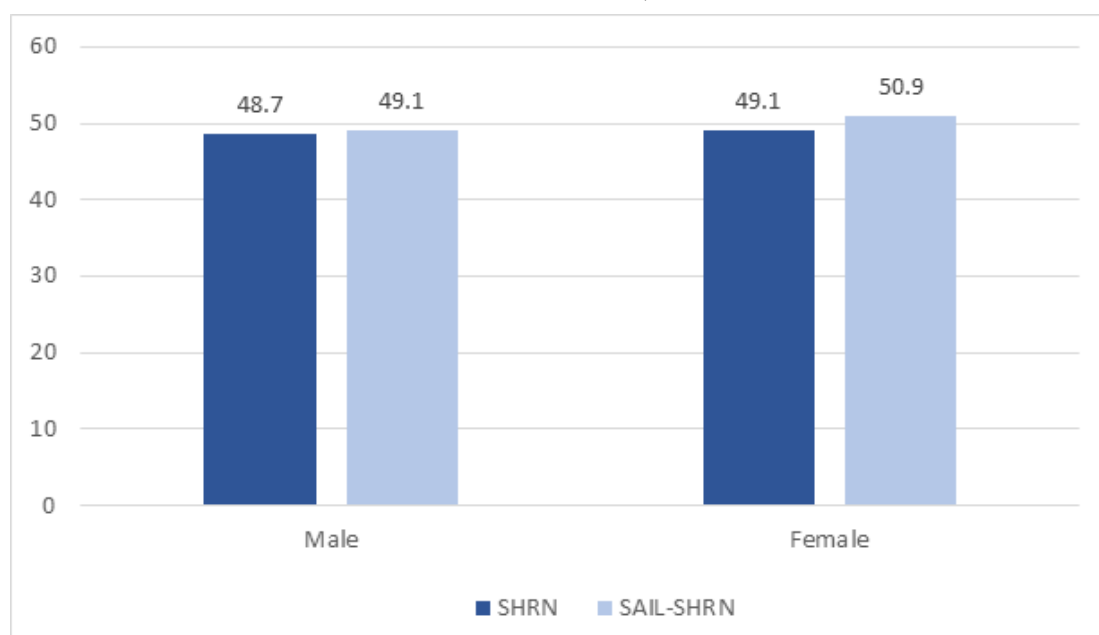


Figure 2 presents the percentage distribution of respondents by sex for two datasets (i.e., SHWS and SAIL-SHWS). The SHWS sample comprises 48.7% male and 49.1% female respondents, indicating a near-equal gender distribution. The SAIL-SHWS dataset reflects a slightly more pronounced difference, with 49.1% male and 50.9% female respondents. While both datasets exhibit close to gender parity, the SAIL-SHWS sample has a modestly higher proportion of female participants compared to the SHWS dataset.

<sup>2</sup> UPRN - unique identifier assigned to every addressable location or property in the United Kingdom

**Figure 3 - Percentage distribution of respondent's Year-Groups (11-16-year-olds).**

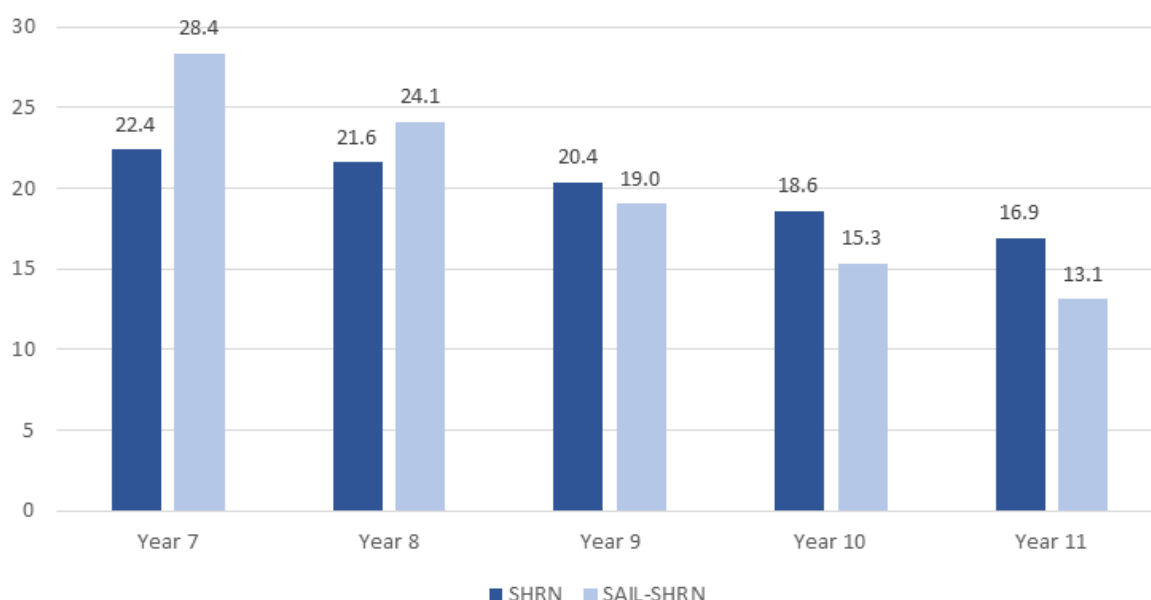
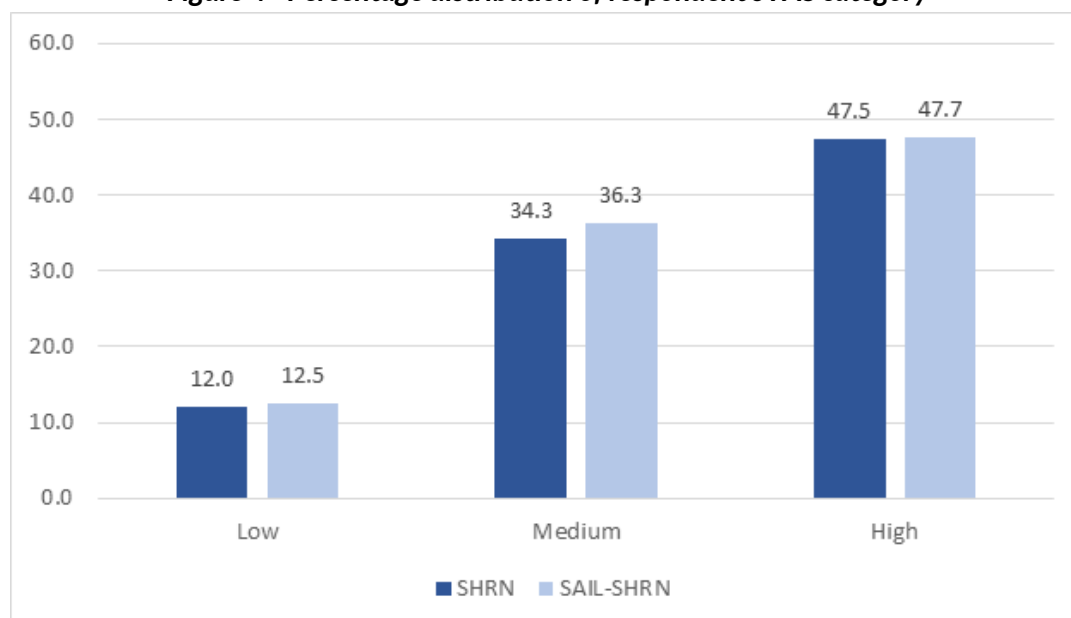


Figure 3 illustrates a declining trend in the participation of students across school years, with values decreasing from 22.4 in Year 7 to 16.9 in Year 11. However, the trend is similar in the SAIL-SHWS sample with participation rates decreasing from 28.4 in Year 7 to 13.1 in Year 11. We also explored for any potential differences in terms of socio-economic characteristics. Figure 4 presents the participation percentages by the Family Affluence Scale (FAS) indicating that students from wealthier backgrounds participated more in the survey in both the original as well as the SAIL-SHWS sample.

**Figure 4 - Percentage distribution of respondent's FAS category**



<sup>3</sup>. The HBSC Family Affluence Scale (FAS) has been employed to estimate young people's socio-economic status, based on a set of questions which measure the material conditions of the household in which young people live. This is a composite measure of material affluence which includes bedroom occupancy; number of household bathrooms; car, computer, and dishwasher ownership; and family holidays. It is a continuous measure with scores ranging from zero to 13, where higher scores reflect greater affluence. For the purposes of this Data Insight, FAS was categorised as low, medium and high to indicate the level of family affluence. (see [5] for more detail).

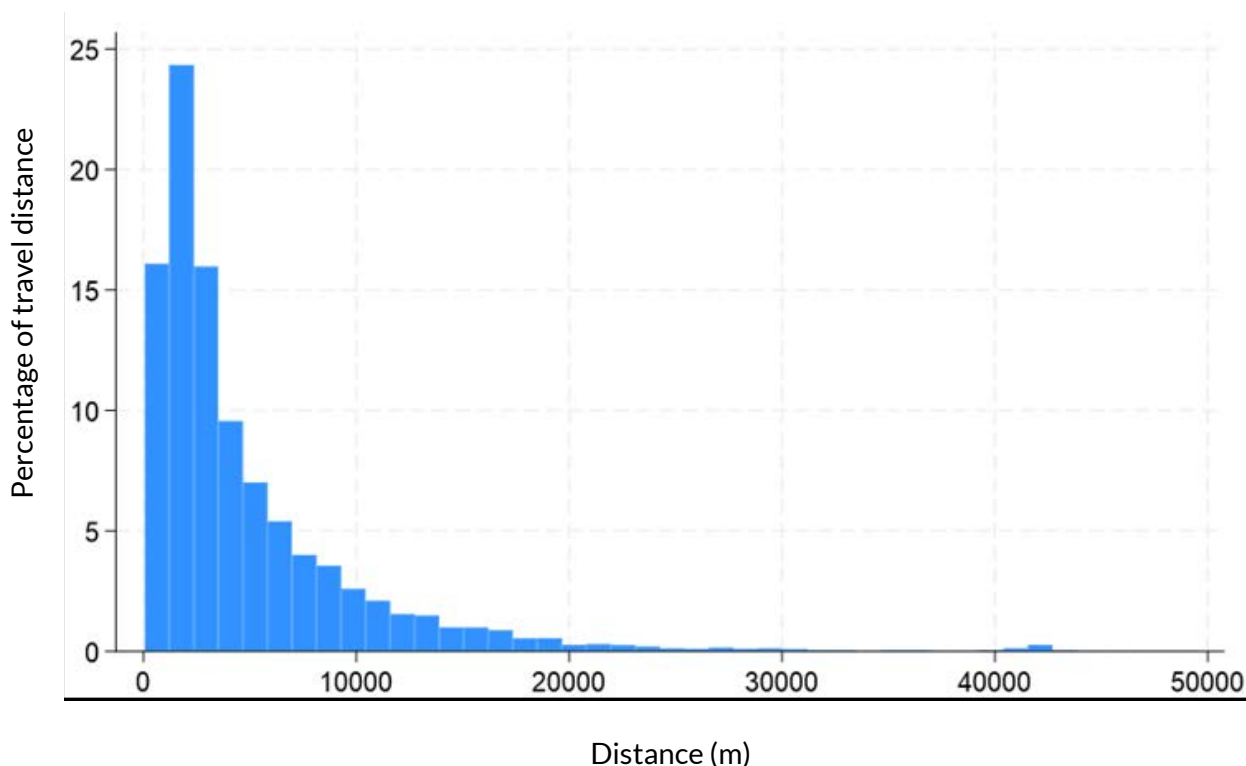
We conducted z-score tests to determine whether the SHRN and SAIL-SHRN samples differ across key demographic variables. Findings demonstrated statistically significant differences in the distribution of sex, particularly among females, as well as across year groups 7 to 11. Additionally, differences were found in the FAS between the two samples. Findings indicate that while both samples follow similar patterns amongst the variables explored, the samples are not fully comparable (on these variables), which should be considered in subsequent analyses and reporting.

### Travel distance distribution based on the SAIL- SHWS sample

As discussed, a key component of the study involved the calculation of the distance children travelled to school that was then linked to the school and SAIL-SHWS sample. As expected, travel distance data revealed a highly right-skewed distribution (Figure 5). A small number of extreme values (outliers) were observed at distances exceeding 30,000 metres. To minimise bias, we applied an Interquartile Range (IQR) method, removing all observations above 13,170 metres.

To explore distance patterns more effectively, we converted the distance from meters to miles to align with the requirements of the Learner Travel (Wales) Measure 2008, which specifies distances in miles. Descriptive analysis showed that 95% of those who reported active travel to school actively travelled up to 3 miles to school, with 57% actively travelling up to 1 mile, 36% travelling between 1.1 and 2 miles and 4% travelling between 2.1 and 3 miles.

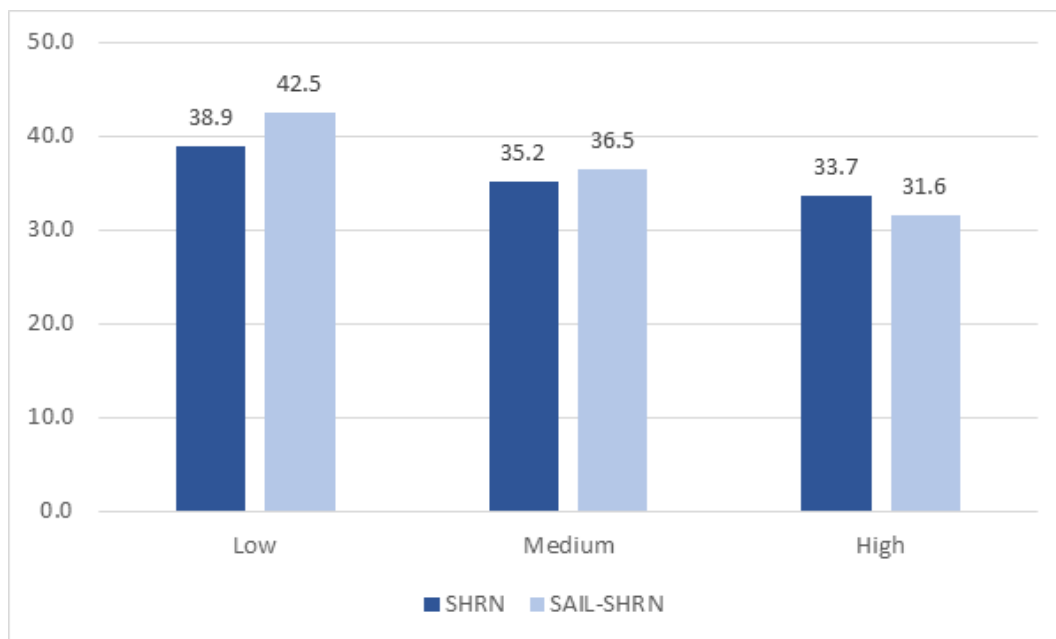
**Figure 5 - Histogram of distance (m) travelled from home to school for the 2019 SAIL-SHWS survey cohort**



### Active travel patterns

Active travel prevalence was consistent across datasets, with approximately 35% of pupils reporting walking or cycling to school (SHWS: 35.0%; SAIL-SHWS: 34.9%). Gender-based differences were evident, with boys reporting higher ATS rates than girls (SHWS: 36.9% vs. 33.1%; SAIL-SHWS: 37.2% vs. 33.0%). A clear socio-economic gradient was observed in both samples: ATS rates declined with increasing family affluence (Figure 6).

**Figure 6 - Active travel participation percentages by FAS category: (a) SHWS and (b) for SAIL-SHWS**



When exploring distance by active travel choice based on the linked distance and SAIL-SHWS sample, findings demonstrated that students who actively travelled to school had a mean home-to-school distance of 1,731 metres, compared to 4,950 metres among those who used non-active transport modes to school (Table 1). This finding highlights the critical role of distance in shaping travel behaviour.

**Table 1 - General characteristics of distance (in metres) travelled to school by mode (active vs. non-active travel)**

Active travel to school	Mean (SD)	25% IQR	75% IQR
Non-active travel	4,951 (3,004)	2,580	6,780
Active travel	1,731 (1,398)	900	2,040

IQR: Interquartile range  
SD: Standard Deviation

## What we found?

Results demonstrated consistency in demographic patterns and travel behaviours between the original and linked datasets despite the reduced sample size. However, the samples are not fully comparable, which should be considered in subsequent analyses and reporting. Un-adjusted analysis revealed that active travel to school was more prevalent among boys and declined progressively with increasing levels of family affluence.

This Data Insight showed that linked SHWS can be utilized by various projects, advancing opportunities to explore pathways to improved health and well-being among the younger generations. Building on these initial findings, the research team plans to develop advanced logistic and multilevel regression models to further analyse the impact of demographic, socio-economic and school-level variables. We also plan to conduct

Receiver Operating Characteristic (ROC) curve analysis to establish distance thresholds differentiating active and passive travel. Our research findings will be disseminated through the project, with the ultimate goal of developing more effective planning policies and implementation strategies to improve health and life-course outcomes for the current and future generations of children.

## Implications for policy and practice

Understanding travel behaviour among schoolchildren is essential for policymakers, urban planners, and public health officials. Implications that we will be able to derive from the active travel project, that is currently in progress, are:

- Localised planning to support active travel to school policies
- Help in designing targeted interventions to encourage active travel, particularly among specific population sub-groups that may be identified as more likely to rely on passive transport
- Enhanced monitoring and evaluation frameworks, in line with recommendations from the Senedd's 2022 expert review, to assess the impact of future ATS interventions over time.

Further findings and insights could inform research direction and targeted policy interventions that address structural barriers to active travel, particularly those related to distance and potential socio-economic inequalities, to support more sustainable school commuting practices.

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## **Funding**

This work is also supported by Administrative Data Research (ADR) Wales, part of the ADR UK investment which is funded by the Economic and Social Research Council (ESRC).

## **Acknowledgments**

We would like to thank all the School Health Research Network young people and schools for their participation in the study. We also wish to acknowledge the collaborative partnership with the School Health Research Network that enabled acquisition and access to the de-identified data, which led to this output. All research conducted has been completed under the permission and approval of the SAIL independent Information Governance Review Panel (IGRP) project number 1001. We would finally like to acknowledge all the data providers who enable SAIL to make anonymised data available for research.

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ADR Wales unites specialists from Swansea University Medical School and the Wales Institute of Social and Economic Research and Data (WISERD) at Cardiff University with specialist teams within the Welsh Government. The cutting-edge data analysis techniques and research excellence developed, along with the world renowned SAIL Databank – which is an accredited processor under the 2017 Digital Economy Act (DEA) – allow the delivery of robust, secure and informative research that can inform future policy decisions in Wales. The ADR Wales programme of work is aligned to the priority themes as identified in the Welsh Government’s Programme for Government. ADR Wales is part of the Economic and Social Research Council (part of UK Research and Innovation) funded ADR UK (grant ES/W012227/1).

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