NIHR | Public Health Intervention Responsive Studies Team

Zero Emission Bus Regional Area (ZEBRA) scheme: The Introduction of zero-emission buses in Oxford

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PHIRST PHRESH

20 Years

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Introduction

- In 2022, Oxfordshire County Council secured £32.8m from the Department for Transport Zero Emission Bus Regional Area (ZEBRA) scheme.
- 159 battery-electric buses introduced across 34 Oxford SmartZone routes by the end of 2024.
- PHIRST PHRESH evaluation investigated air and noise pollution changes before and after the introduction of battery electric buses in Oxford.
- PHIRST PHRESH: collaboration between the Universities of Birmingham, Warwick and Keele.

What information did the council ask for?

- Oxfordshire County Council: health co-benefits of bus electrification, NHS and social care cost savings via reduced air and noise pollution.
- Bus companies: how ticket sales had changed, and whether patronage was widening to new or different groups. *

  * beyond scope of the PHIRST evaluation but useful context for future recommendations for mandatory data returns for ZEBRA scheme (nationally).

How did you try an answer their questions?

- Data collected on air and noise quality changes before, during and post-implementation of the introduction of electric buses in the city:
    - key pollutants ($PM_{2.5}$, NO_2)
    - noise changes (dB) at roadside.

      (Routes where buses had high, medium and low levels of traffic dominance (as a ratio of buses: other vehicles).
- Updated bespoke Air Quality and Health Lifecourse Assessment Tool for Oxfordshire - health risks associated with $PM_{2.5}$ (child asthma, ischaemic heart disease, stroke, dementia) and NO2 pollution
- Data on impact of road traffic noise on risk of Type II diabetes and stroke (from literature).
- Dwelling dataset for the city used –people living near roads experienced benefits consistent with those on high/medium/low bus dominant routes.
- Modelling tool used to assess health and economic benefits of the scheme

Were there questions you weren't able to answer?

Full cost-benefit analysis not possible:

- total amount of the funding package for the ZEBRA scheme available
- full information on the commercial impact on ticket sales not available

What data did you need? How did you know you had enough data / the right data?

- High resolution environmental data (using existing infrastructure)
- Existing health outcome data at LSOA level
- Access to funding for ZEBRA scheme available, but no access to potentially commercially sensitive data

How did you communicate and present the method to senior stakeholders? (did you present the method at all?)

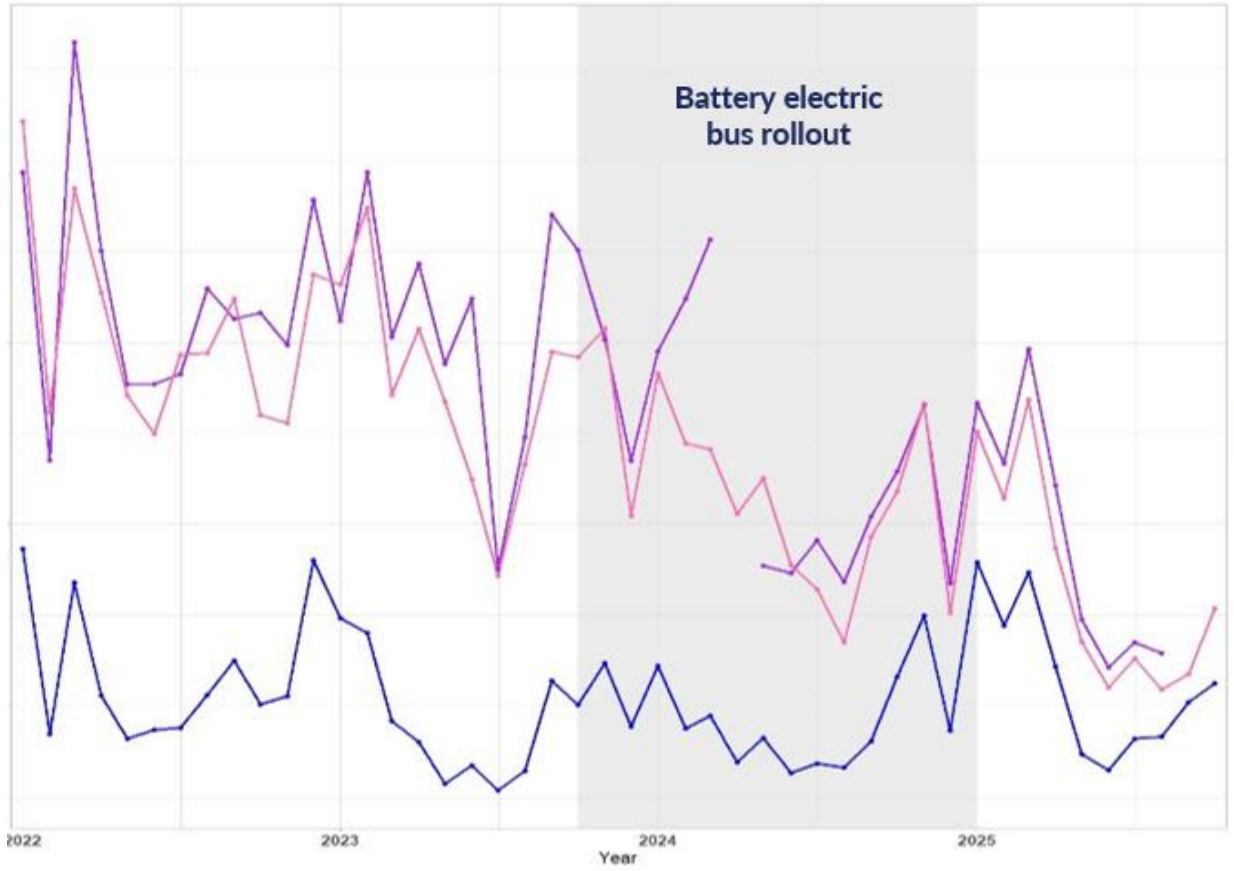
- Briefing notes –decision makers more interested in the outcomes than methods

- Confidential briefing session (with slides) for Cabinet members

Electric buses reducing air and noise pollution in Oxford, research suggests

How did you communicate and present the method to senior stakeholders? (did you present the method at all?)

- On average, NO_2 levels reduced by 10% across the city in 2024 (from 2023).
- Reductions of up to 24% were observed in central areas of high bus traffic (Oxford High Street and St Aldates).
- Air quality data analysis (including $PM_{2.5}$ and PM_{10} concentrations) ongoing



Monthly average Nitrogen Dioxide (NO2) concentration by reference monitoring station // Purple: Oxford Centre (St Aldates) – Roadside. Pink: Oxford High Street – Roadside. Blue: Oxford St Ebbes – Urban Background. Data available at https://www.oxonair.uk/data

How was the evaluation used?

- Business case to extend the ZEBRA scheme beyond Oxford City
- Submission for the Transport Decarbonisation Awards (winner!)

£5 million investment to deliver more electric buses to Oxfordshire

7 months ago Thu 26th Mar 2026

Further information

Links to briefings & further information

- https://phirst.nihr.ac.uk/evaluations/zebra-scheme-oxford/
- https://phirst.nihr.ac.uk/phirst-phresh-evaluation-of-the-impact-of-electric-buses-in-oxford/ (award)
- https://www.oxfordbus.co.uk/ps5-million-investment-deliver-more-electric-buses-oxfordshire (further investment)
- https://news.oxfordshire.gov.uk/electric-buses-reducing-air-and-noise-pollution-in-oxford-research-suggests/

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Thank you

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