Improving Air Quality in Merton

Scoping report

THE BEHAVIOURAL INSIGHTS TEAM

In partnership with

Cabinet Office

Local Government Association

merton

CONTEXT - COVID implications

- This scoping phase and report was largely completed before the current COVID pandemic resulted in school closures and a UK-wide shutdown. Our recommendations still hold, however timelines will need to be reviewed to account for the potential for schools to remain closed and any impact COVID may have on our work or that of any stakeholders.

- We can continue to work largely as planned for the next 1-2 months while we design the intervention and investigate the logistics of implementing different design options. However, from around late May we will need to revise timelines to account for when schools are likely to reopen so that we can engage them in the design phase and set up the trial.

- For each month after May schools are not open and back to normal operation, we will need to delay our project timelines by approximately one month, although we may only be able to install interventions in schools during holiday periods, potentially pushing timelines back further (e.g., to the next holiday period)

Contents

Background

THE BEHAVIOURAL INSIGHTS TEAM

Introduction to the project

- The goal of this project is to implement and evaluate an intervention to reduce the number of cars idling outside primary schools during pick-up and drop-off times in the London Borough of Merton (LBM). This, and other anti-idling measures, have the ultimate aim of improving air quality.

- We don't know current idling rates, but based on our understanding of past anti-idling campaigns the majority of drivers idle outside school, but are happy to switch their engine off when asked. As idling rates are not systematically collected, we do not know if past anti-idling campaigns have led to long-term behaviour change, however idling still appears to be an issue at schools and so we need to find a way to encourage drivers to switch off their cars.

- Moreover, past anti-idling campaigns have often involved a level of enforcement, which is both costly and potentially unnecessary if drivers can be reminded in the moment to switch their engine off. This project will therefore explore using behavioural insights to encourage drivers to switch their engines off without the use of enforcement.

- This project is jointly funded by LBM and the Local Government Association (LGA). It is part of the LGA's Behavioural Insights programme.

Purpose of Scoping Report

- This project begins with a short ‘Scoping Period’. The goal of this period is to establish whether a full project (including the design, implementation and rigorous evaluation of a behavioural insights intervention) is feasible.

- This report summarises our findings from this scoping work. On the basis of our scoping research, we recommend running a before-after trial with driver behaviour as the outcome measure. We will continue to investigate different intervention design options during the next stage of the project.

- This report includes the following:
    - A summary of existing anti-idling interventions and measurement
    - An overview of possible intervention approaches
    - Options for possible outcome measures and measurement tools
    - Options for trial design with a recommended approach.

Existing anti-idling interventions and measurement approaches

THE BEHAVIOURAL INSIGHTS TEAM

Common approaches to reducing idling

Public concern over the negative impact of poor air quality on health, particularly in children and vulnerable groups such as the elderly, has been growing. In response, local authorities are increasingly trying to develop effective anti-idling strategies. The three most common approaches to reduce idling in the UK are:

1. **Fines:** Idling is a Fixed Penalty Offence under the Road Traffic Regulations 2002. Increasingly local authorities are using traffic wardens to ask idling drivers to switch their engines off. However, only a handful of authorities have implemented no-idling zones or fine idling drivers. The council issuing the most fines in the UK is Westminster.[1] Their policy is for wardens to ask idling drivers to switch off, and to issue a fine if after a minute the driver still has not complied. **Merton** has trained wardens to talk to drivers, but fines tend not to be issued.

2. **Campaigns:** A more common anti-idling approach is campaigns such as Idling Action London. Alongside wider comms activity by the council, local authority staff organise action events where volunteers are trained and take to the streets in pairs to talk to idling drivers. **Merton** have delivered a range of action days at schools and taxi ranks.

3. **Signs:** Perhaps the most common approach used by councils is to install signs discouraging drivers from idling at key locations such as level crossings, taxi ranks, schools or hospitals. **Merton** have installed signs at around half of schools and many key intersections and crossings.

Key studies of anti-idling interventions

From our brief review of the literature, there is some evidence that campaigns and signage can reduce idling behaviour. However, evaluating anti-idling interventions is challenging. The only studies we found used pre-post designs, and it is therefore difficult to be completely certain that any observed changes were due to the intervention rather than other factors (e.g. weather, or time of year). The most common options for measuring outcomes are (1) measuring air quality using sensors, and (2) observing driver behaviour. Below we outline the two most robust existing studies, which use different interventions and measurement approaches.

Ryan et al (2013) conducted a pre-post evaluation of the Cincinnati Anti-Idling Campaign at 4 US schools. The **campaign** consisted of several school events, **information** sent to parents, and **training** sessions for school bus drivers. They took air quality measurements before and after the campaign, and were able to detect significant improvements at the school with the greatest number of buses and cars but not the others.[2]

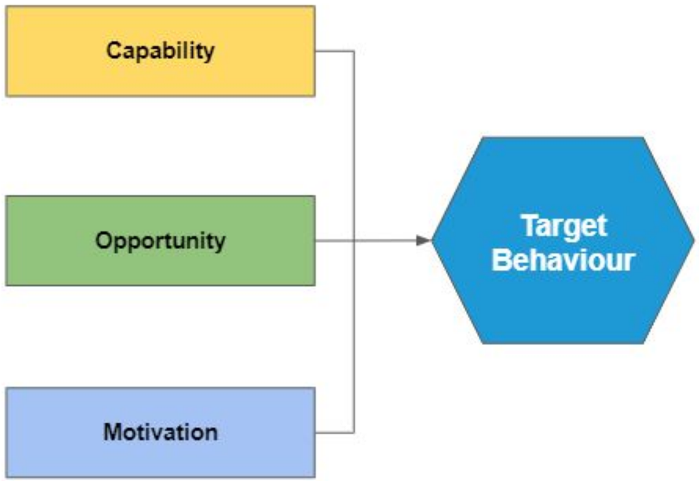
Abrams et al (2019) conducted a pre-post study at two rail crossings in Canterbury (UK) testing the impact of three different **signs** (appealing to responsibility; highlighting impact of switching off; reflecting on one's actions) on **idling behaviour**. All the signs significantly increased the number of drivers switching off their engines but the message appealing to responsibility was most effective (40.5% switched off) compared to baseline (26.4%).[3]

Intervention design and key behavioural concepts

THE BEHAVIOURAL INSIGHTS TEAM

Barriers to switching your car off

From our initial fieldwork and review of the evidence, we have identified the following barriers to drivers switching off their engine outside schools. We have used the COM-B model to group the different barriers to target behaviours:



Barriers to drivers switching off their cars:

- **Reflective Motivation**: Perception that keeping their engine on is better for the car/pollutes less than turning it off briefly;
- **Reflective Motivation**: Desire to keep car heating on when cold
- **Opportunity**: Lack of nearby parking means drivers may stop in places where parking is illegal. Drivers believe that if the engine is on then it is not breaching parking restrictions; and
- **Opportunity** / **Automatic Motivation**: Habitual behaviour - stopping for a short time does not trigger drivers to think about switching their engine off. There are a lack of salient prompts nearby to remind them to do this.

As the majority of drivers switch their car off when asked, we believe that the main barriers are not reflective motivation, and hence less likely to be changed by information provision or changing incentives. Rather, we believe we need to change the context in which people idle their car to tackle their automatic, habitual behaviours in the way enforcement has done.

Environmental design vs other nudges

- In our proposal we recommended designing an 'environmental nudge' to act as an effective trigger to remind drivers to switch off their engine. In this context we use the term environmental nudge to mean using changes to the built environment / local context to trigger behaviour change (as opposed to presenting information differently or redesigning a process).

- This approach can be effective as our surroundings subconsciously influence our behaviour. We may, for example, be more likely to litter in an already littered environment, or observe social distancing rules when clear markers are present on the pavement or within shops.

- This method has proven effective at changing behaviours in different contexts. For example:

    - One meta-analysis of healthy eating nudges found contextual changes (such as changing the size of plates) were more effective than information or emotional nudges[4];

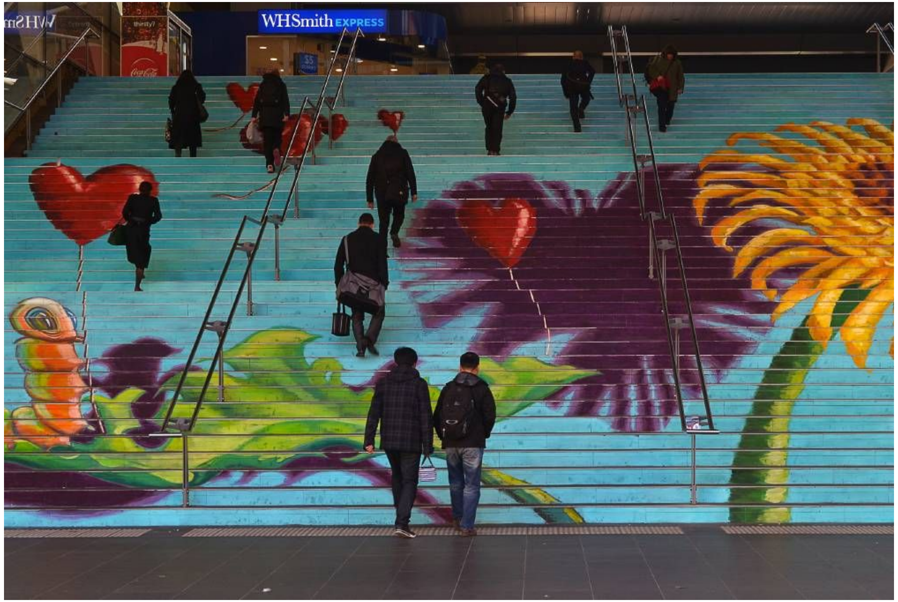
    - Changes to the built environment have successfully stopped people viewing certain public spaces as areas that are safe to urinate in[5] and encouraged people to take the stairs instead of escalators[6] (see next slide).

- A key factor in this approach working is that the intervention stands out enough for drivers to notice the change easily or without thinking about it and therefore make the association between the local environment and their behaviour without effort.

Environmental cues can alter behaviours

Example 1: Colourful images with social images were used to prevent passers by publically urinating in corners in Paris.

Example 2: Painting steps in bright, attractive colours encouraged more people to take the stairs in Melbourne



Options for environmental nudges

We will investigate the feasibility of different environmental nudges. The main trade-off will be between cost and impact, with more noticeable designs likely costing more. Broad options include:

Changing street signs - LBM have already installed signs at nearly half of schools in the Borough. We could investigate different design options to increase their effectiveness (as per Abrams et al.), however local intelligence suggests that these may not be that effective due to streets already having multiple signs (such as parking restrictions) that make these less noticeable.

Banners - Schools can have large banners along their front walls/gate where cars typically idle to make anti-idling messages more prominent. Potentially easier to install than street signs, but as they can only be installed on some walls, may not be able to be placed everywhere idling occurs (e.g., further down the street from the school gate.

Paint pavement / roads where idling occurs - In conjunction with public messaging (signs or mailouts) this could be used to create 'clean air zones' around schools, with drivers told that cars must be switched off within blue coloured areas.

Possible outcome measures and measurement

THE
BEHAVIOURAL
INSIGHTS
TEAM

Options for measuring impact

Our intervention aims to change driver behaviour by getting them to switch their car off, however the ultimate aim is to improve air quality outside schools. We can therefore either measure the impact our intervention has on **air quality** or **driver behaviour.**

Air quality:

- Advantage: More meaningful measure of social impact, collection done automatically.
- Disadvantage: Is influenced by other factors and may not change sufficiently in response to reduced idling. Costly / difficult to measure
- Options: Assessed through either stationary or mobile air quality monitors (e.g., those measuring PM or NO2 gasses, or multi-purpose Zephyr Air Quality sensors).

Driver behaviour

- Advantage: Less influenced by other factors, no devices needed.
- Disadvantage: Costly to measure, manual counting may cause errors.
- Options: Behaviour monitored by research assistants, school staff, other stakeholders or by installing cameras outside schools.

Air quality vs behaviour monitoring

The table below summarises our assessment of how robust and feasible each option is. Based on this we recommend using **driver behaviour** as our outcome measure.

Approach	Robustness and past use	Cost / Feasibility
Air quality	Ryan et al (2013) used stationary monitors during their anti-idling campaign, but were only able to detect a change in air quality at one school with many buses. We spoke to an expert at King's College London who confirmed that even state of the art equipment is not suitable to evaluate anti-idling projects because: 1. resulting changes are too small and 2. air quality is affected by too many other factors to be robustly measured.	Tracking air quality would require Merton to buy / rent multiple versions of the same tool to be able to measure at multiple schools at the same time. Expert advice suggests that changes in air quality due to reductions in idling will be too small for monitors to detect.
Behaviour monitoring (BM)	It is an outcome we can easily measure as it is an observable behaviour, and is less influenced by outside factors. We can be more confident that the effect observed was due to our intervention. Abrams et al (2019) were able to detect an effect of their signs on driver behaviour, and used research assistants for monitoring.	Cameras are likely to be too expensive and using school staff may not be reliable enough. We believe using research assistants is the most promising approach and have provided costings for this, however will continue to investigate other options going forward.

Trial design and power calculations

THE BEHAVIOURAL INSIGHTS TEAM

Trial design assumptions

To determine the most suitable trial design and the number of primary schools required to be able to detect a meaningful effect, we need to estimate the number of cars dropping pupils at each school (and hence the current baseline of cars that are idling).

We have therefore based our power calculations and assessment of the most feasible trial design on the following assumptions. These were informed by figures from past anti-idling events in nearby Boroughs and publicly available data on school numbers. We will continue to review these during the project:

- Average number of pupils per primary school in Merton: **432** pupils per school
- Approximately 1.5 pupils per family: **288** families per school
- Between **10%** and **30%** of families drive to school (this is a conservative estimate, more drivers will give us more observations, meaning we need fewer schools)
- Families who drive to school do so **twice a day**
- Estimated number of cars:
    - 10% of families drive → **58 cars per day**
    - 30% of families drive → **173 cars per day**

Trial design options

We considered two trial design options: Clustered RCT and a Before-After study

Cluster RCT - not recommended

Pros:

- We can be more certain that any change in driver behaviour is due to the intervention and not other factors.

Cons:

- A large number of clusters are required. Our best case estimate requires **19** schools, but we may need more than **40** out of the 66 in Merton.
- We will need to collect baseline data as otherwise more schools will be needed than are in Merton.
- School cross-contamination from parents at other schools hearing about/noticing the intervention may complicate results.

Cost estimate of data collection: **£7-16k**

Before-After trial - recommended

Pros:

- Fewer schools are required - we estimate needing **2-10** schools for a trial.
- Cross schools contamination is not a concern as all participating schools will receive the intervention.

Cons:

- Baseline data collection needed.
- We cannot be as certain that changes in driver behaviour are due to the intervention and not other changes over time. We can minimise this by controlling for weather, measuring on the same week day, and ensuring no special events occur during the trial period that may change behaviour.

Cost estimate of data collection: **£3-12k**

Proposed project structure and next steps

THE BEHAVIOURAL INSIGHTS TEAM

Recommendations

Based on our scoping work we recommend that for the next phase of the project, we:

1. Measure driver behaviour rather than air quality due to the low likelihood we can robustly measure air quality. This will most likely involve physically counting cars, however we will still explore virtual options such as using cameras due to potential ongoing social distancing measures;

2. Work towards conducting a before-after trial, with between 2-10 schools (we do not recommend recruiting more schools than needed for the trial as each extra school will increase costs from installing the intervention, and collecting data);

3. Focus on investigating different intervention design options and data collection methods.

Project structure

We propose delivering this project in two stages:

Design: We will conduct further fieldwork and research to investigate intervention design options and develop solutions material. During this phase we will seek LBM and LGA agreement to a final intervention approach by:

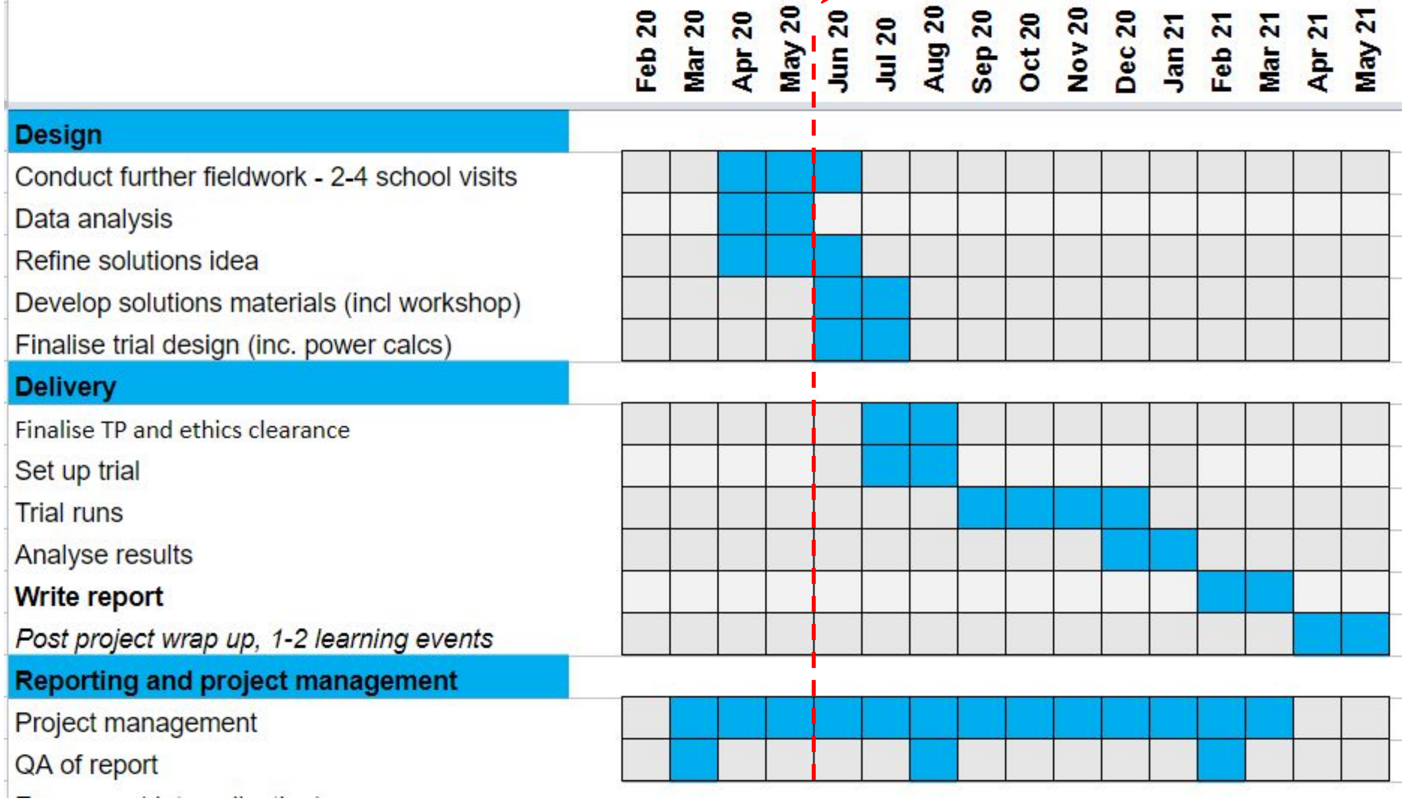
- Investigating costs of each design option;
- Working with participating schools to determine which option fits best within the local context;
- Determine the logistics for setting up different design options (e.g., talking to highways team re permits, parking team re signage).

Delivery: We will finalise our trial design, set it up by installing the intervention, and conduct our evaluation. During this phase we will:

- Investigate different data collection methods and costs to use for our evaluation;
- Run the evaluation, collect and analyse results, and report back.

Current project plan

All timelines after May will need to be pushed back to start once schools reopen



Annex - power calculations

THE BEHAVIOURAL INSIGHTS TEAM

Clustered RCT without baseline

Sample size (30% families drive)	ICC (Intra-cluster correlation coefficient) estimate	ESS (Effective Sample size)	Control (% idling)	Treatment (% idling)	MDES	Cohen’s d	Estimated cost
628 schools	0.2	3068	0.60	0.55	0.05	0.1	N/A
437 schools	0.2	2136	0.60	0.54	0.06	0.12	N/A
159 schools	0.2	776	0.60	0.5	0.1	0.2	N/A
71 schools	0.2	346	0.60	0.45	0.15	0.3	N/A

Clustered RCT with baseline

Sample size (30% families drive)	ICC (Intra-cluster correlation coefficient) estimate	ESS (Effective Sample size)	Control (% idling)	Treatment (% idling)	MDES	Cohen's d	Estimated cost (Baseline + Post intervention data collection)
170 schools	0.05	3068	0.60	0.55	0.05	0.1	N/A
119 schools	0.05	2136	0.60	0.54	0.06	0.12	N/A
43 schools	0.05	776	0.60	0.5	0.1	0.2	(£8,063* 2) £16,126
19 schools	0.05	346	0.60	0.45	0.15	0.3	(£3,563* 2) £7,126

Before-After study

Sample size (cars, sampling if 30% drive, sampling if 10% drive)	Control (% idling)	Treatment (% idling)	MDES	Cohen's d	Estimated cost (if 30% of families drive)	Estimated cost (if 10% of families drive)
3068 cars (30%: 5 schools, 4 days, (10%: 10 schools, 6 days)	0.60	0.55	0.05	0.1	£3750	£11250
2136 cars (30%: 4 schools, 4 days, 10%: 10 days, 4 days)	0.60	0.54	0.06 (10%)	0.12	£3000	£7500
776 cars (30%: 2 schools, 3 days, 10%: 4 schools, 4 days)	0.60	0.5	0.1	0.2	£1125	£3000
346 cars (30%: 2 schools, 2 days, 10%: 2 schools, 4 days)	0.60	0.45	0.15	0.3	£750	£1500

References

THE
BEHAVIOURAL
INSIGHTS
TEAM

References

1) DEFRA (2019). Anti-idling campaigns - evidence review.

2) Ryan, P. H., Reponen, T., Simmons, M., Yermakov, M., Sharkey, K., Garland-Porter, D., ... & Grinshpun, S. A. (2013). The impact of an anti-idling campaign on outdoor air quality at four urban schools. Environmental Science: Processes & Impacts, 15(11), 2030-2037.

3) Abrams, D., Hopthrow, T., Imada, H., Ozkececi, H., Lalot, F., & Templeton, A. (2019). Can Car Engine Idling Be Reduced Using Persuasive Messages? Canterbury Air and Noise Experiment 2018-19.

4) Cadario, R., & Chandon, P. (2019). Which healthy eating nudges work best? A meta-analysis of field experiments. Marketing Science.

5) https://www.campaignlive.co.uk/article/ogilvy-kills-public-urination-optical-illusions/1593153

6) VicHealth (2016). Behavioural insights and healthier lives.