MONITORING NOISE COMPLAINTS - THE PUBLIC HEALTH OUTCOMES FRAMEWORK INDICATOR B14A

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1   INTRODUCTION

Environmental noise pollution has significant adverse impacts on both quality of life and health, including associations with chronic annoyance and sleep disturbance, and cardiovascular disease [1, 2]. Neighbour and neighbourhood noise are also responsible for a significant adverse impact on health and quality of life [3-5], but the exposure can be more difficult to characterise at a national, regional and local level. Noise complaint statistics can be useful for mapping and quantifying exposure to, and the impact of, neighbour and neighbourhood noise in the wider population,[6] provided that the multiple complex relationships with socio-economic factors are taken into consideration[7].

Local Authorities (LAs) in England are responsible for investigating certain types of complaints about neighbour and neighbourhood noise [8]. LAs are local governance structures and are organised in two ways: upper and lower tier LAs, and unitary LAs. Upper tier LAs, usually a County Council, cover a large area within which are several smaller lower tier LAs, often called district councils. Alternatively, services are provided by a single unitary council, such as the London Boroughs [9]. Since the 1990s, there has been reorganisation of LAs, reducing their total number. Examples include Cornwall, where the County Council took over the function of the lower tier LAs that were abolished, and Bedfordshire where the upper tier Bedfordshire County Council was abolished, and the lower tier LAs took over its functions. There are also several 'shared services' that serve more than one LA, such as Rother and Wealden District Councils [10].

Upper tier local authorities lead on public health. Lower tier LAs provide Environmental Health functions and are required under section 79 of the Environmental Protection Act 1990 to investigate complaints that could be a 'statutory nuisance'. Unitary LAs provide both Public Health and Environmental Health functions.

The Office for Health Improvement and Disparities (OHID) publishes performance indicators, also referred to as 'fingertips', as part of the Public Health Outcomes Framework (PHOF[1]). The PHOF sets out a vision for public health to "improve and protect the nation's health, and improve the health of the poorest fastest." [11]. Two target high level outcomes were established:

1. Increased healthy life expectancy
2. Reduced differences in life expectancy and healthy life expectancy between communities.

There are then five groups of indicators, referred to as 'domains':

- Overarching indicators
- Wider determinants
- Health improvement
- Health protection
- Healthcare and premature mortality

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[1] https://fingertips.phe.org.uk/profile/public-health-outcomes-framework

The PHOF indicators are reviewed every three years, and in so doing ensures that the framework is appropriate and relevant [11, 12]. The PHOF is not a performance management tool for local authorities, but rather its data enables local authorities to benchmark and compare their own outcomes with other local authorities [13].

1.1   Noise aspects within the Public Health Outcomes Framework—B14

Within the domain of "Improving the wider determinants of health," there is the fingertip, "B14 The percentage of the population affected by noise."

B14 is further subdivided into three indicators:

- B14a: The rate of complaints about noise
- B14b: The percentage of the population exposed to road, rail, and air transport noise of 65 dB(A) or more during the daytime
- B14c: The percentage of the population exposed to road, rail, and air transport noise of 55 dB(A) or more during the night-time

PHOF B14a is an indicator of neighbour and neighbourhood noise complaints for all lower tier and unitary LAs. The PHOF for an upper tier LA is calculated from the lower tier LAs within its area. The calculation of PHOF B14a requires data about complaints recorded by these local authorities (LAs). Since 2000, the Chartered Institute of Environmental Health (CIEH) has been surveying LAs on the number of noise complaints they receive [14], and shares this data with the UK Health Security Agency (previously Public Health England) for the compilation of this indicator.

B14b and B14c represent daytime and night-time noise exposure determined by strategic noise mapping (produced to fulfil the requirements of the Environmental Noise (England) Regulations 2006, as amended) using national calculation methods and input data supplied from the relevant authorities. The results are overlaid on a residential population dataset from the Office of National Statistics (ONS) to determine number of people exposed per authority. These two indicators are only calculated for upper tier and unitary LAs.

The noise indicators within the PHOF reflect the government's acknowledgment of noise as important determinant of public health, in line with the Noise Policy Statement for England.

1.2   Synergy with the Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (NPSE) defines the Noise Policy Aims [15]:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:
- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

There is a clear synergy between the policy aims of the NPSE and the PHOF vision to improve and protect the nation's health, and improve the health of the poorest fastest. Table 1 below shows the categorisation of noise as defined in the NPSE, the relevant PHOF indicator, and the appropriate jurisdiction of the local authority. B14 could be used as a measurement of the impact of the NPSE in the medium to long term. However temporal trends should always be interpreted with caution. For example improvements in noise modelling technologies and better availability and accuracy of the input data may lead to an apparent increase in the number of people exposed or the number of complaints. B14 can also be used to inform the allocation of resources within LAs.

Table 1: NPSE noise categorisation, PHOF indicator, and relevant local authority jurisdiction

NPSE Noise Category	PHOF	LA
Environmental	B14b, B14c	Higher Tier / Unitary
Neighbour	B14a	All
Neighbourhood	B14a	All

2 METHODOLOGY

As stated earlier, the PHOF B14a indicator is based on raw data collected by the CIEH Noise Survey. The survey asks about the number of total complaints a LA has received that year. It also asks for details about the source of noise complaints (e.g. neighbour, transport, or construction), enforcement action and staffing, however this information is not used for B14a. B14a is determined as the number of complaints divided by the ONS population figure in thousands, thus giving the number of complaints per thousand population.

2.1 Modelling of B14a

144 LAs in England (45%) responded to the CIEH's 2020/21 noise survey. Return rates ranged from 66% of LAs in the East Midlands, to 24% of LAs in the Northeast [14]. Only 200 (62.5%) of LAs have made a return to the CIEH survey in the last 5 years.

Figure 1 below shows the number of LAs that last made a return to the CIEH survey within a specific year between 2002 - 2021.
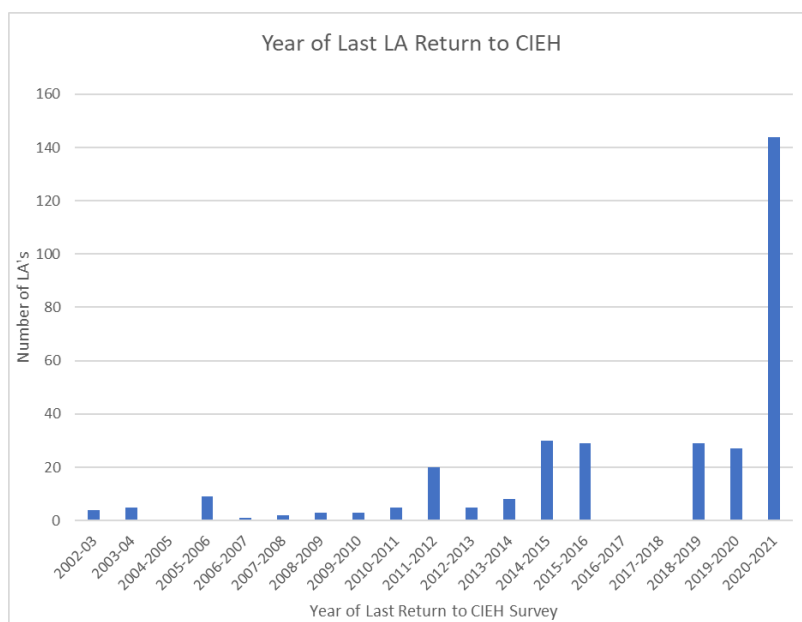

Figure 1: Bar plot displaying the number of local authorities that last made a return to the CIEH survey within a specific year

These return rates are less than those found in comparable surveys of LAs. Broadly, the same LAs that investigate noise complaints are usually those that also undertake food hygiene inspections. The

comparable Food Standard Agency (FSA) LAs Performance update for 2021/22 was based on 97% of expected returns for food hygiene [16].

When an LA does not provide a return in a given year, the value of B14a for that LA needs to be modelled. Every LA is categorised as either rural, semi-rural, or urban. The average of each category is calculated and referenced back to the last time the LA made a return. The figure is then divided by the ONS population figure in thousands. The data are modelled as outlined below [17].

Where data are modelled, the calculation is based on the following (simplified) formula for each DEFRA rural, semi-rural, and urban classification, see Equation 1 below and a worked example in Section 2.2:

$$a = x \left(\frac{\Sigma y_i}{\Sigma z_i} \right) \mid \Sigma y_i > 0, \Sigma z_i > 0 \qquad (1)$$

where a is the modelled complaint data, x = the most recent complaint data for a given LA, $\sum y_i$ = The sum of all values for those LAs who returned data in the relevant reference year who also returned data in the last data return year for the given LA for whom data are being modelled, in the same rural, semi-rural, or urban classifications, and $\sum z_i$ = the sum of all values for those local authorities who returned data in the last year the LA for whom date are being modelled who also returned data in the relevant reference year, with the same rural, semi or urban classification [17].

2.2   Worked example of the equation used in modelling PHOF B14a

Data for Bournemouth Christchurch and Poole (BCP) Council, an urban council, for 2020/21 must be modelled. The most recent data provided by the council was in 2019/2020, when they reported 1412 noise complaints.

$\sum y_i$ was 218,791, the sum of all complaints for 2020/21 from all urban councils that returned data in both 2019/2020 and 2020/21.

$\sum z_i$ was 91,028, the sum of all complaints for 2019/2020, the most recent year for which there is data for BCP, from all urban council that returned data in both 2019/2020 and 2020/21.

$\frac{\Sigma y_i}{\Sigma z_i}$ gives a factor of 2.4.

1412, the number of noise complaints BCP reported in 2019/2020, is multiplied by 2.4 giving 3,393 as the number of complaints BCP is modelled to have had in 2020/21. The ONS states BCP had a mid-2020 population of 396,989, giving 8.55 noise complaint per 1,000 population.

3   RESULTS AND DISCUSSION

In total for England, there were 678,896 estimated noise complaints received in 2020/21 and the rate of complaint was 12 per 1,000 population.

Figure 2 below shows the results of B14a in England for the period 2010/11 to 2020/21[18]. It should be highlighted that the CIEH paused its noise survey in 2015 and resumed the survey in 2018/19, partly at the request of PHE.
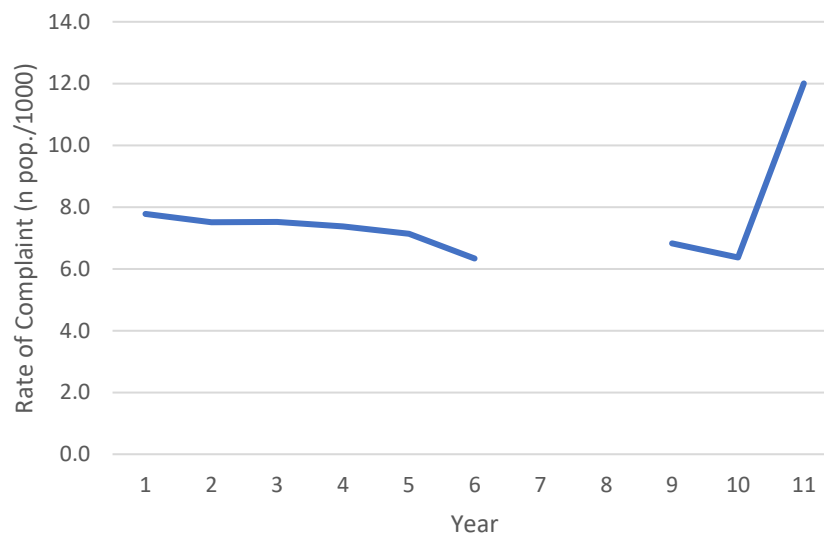
Figure 2: Line plot displaying the rate of complaint as modelled for PHOF B14a for England in the period 2010/11 to 2020/21. Whilst the results here are displayed at a national level, a variety of data resolutions are available when using the tool e.g. national, regional, local authority, and unitary authority resolutions

The Royal Borough of Kensington and Chelsea had both the highest number of complaints, 114,721 in total, and the highest rate of complaints at 731.3 complaints per 1,000 population. The median rate of complaint was 6.9 per 1,000 population observed in Slough Borough Council. Cheshire West and Chester has the lowest rate of complaint at 0.9 per 1,000 population, receiving a total of 323 complaints. However, Rutland had the lowest number of total complaints, 78, with a rate of complaint of 1.9 per 1,000 population.

The highest values for both the rate of complaints and the total complaints received were observed for The Royal Borough of Kensington and Chelsea. Westminster City Council received the second highest rate of complaint of 158.87 per 1,000 population. Both provide out-of-hours noise services, indicating potential bias in the number of complaints, and thus rate of complaints, towards authorities offering such services [19, 20]. This demonstrates that comparisons across LAs need to take into consideration a broad range of potential confounders.

Using noise complaint data as a measure of neighbour and neighbourhood noise within the PHOF has a number of advantages. It is relatively easy and cost-effective to obtain, as the majority of LAs already record this data, either as part of their own internal performance indicators, and/or from previous experience of the CIEH survey. Computer systems used by LAs have been designed to capture this data, e.g. Uniform and M3, which are complaint management systems.

In applications for Nationally Significant Infrastructure Projects (NSIPs), Applicants are already using Health Profiles, and it is expected that PHOF may be used to inform applications in the future [21]. PHOF has been used in the academic literature to show an association between PHOF B14a and measures of deprivation [7]. They can also be used by LAs and Clinical Commissioning Groups when writing their Public Health Joint Strategic Needs Assessments (JSNAs) to determine the current and future health, care, and wellbeing needs.

Conversely, complaint statistics have their limitations. Noise complaints are actions, individual or collective, driven not only by the noise and its evoked annoyance, but also influenced by socio-economic factors [7], the person's feeling to have control of the stressor (i.e. noise), as well as the knowledge of which institution to report a complaint and the expectation of a successful feedback [22]. There is the possibility that the rate of complaints as calculated for B14a could be unreasonably

influenced by a single noisy event such as an illegal rave, or by a vexatious complainant. These scenarios could be particularly influential in authorities with small populations.

The low return rate of LAs providing data is having an impact on the accuracy of PHOF B14a, with some rates having to be calculated from data that is over 15 years old, and therefore this data may no longer be an accurate representation of current, or even recent conditions. This indicator only captures complaints to LAs, whereas complaints on neighbour and neighbourhood noise may also be directed to other organisations such as the Police, Housing Associations, and the Environment Agency. Capturing data from different sources would introduce an extra layer of complexity, for example to account for different collection methodologies, in any analyses.

Another issue is that the recording of noise complaints is not standardised across LAs. Some local authorities may record complaints about the same noise source, made by multiple complainants, as a single complaint, whilst other authorities may record each complaint separately. Complaints about a noise source outside a LA's jurisdiction e.g. transport noise, or an activity regulated by the Environment Agency, may or may not be recorded in their returns.

A response rate comparable to the FSA's LAs Performance update would significantly improve the quality of the data, and therefore the value of indicator B14a. Wider recognition of the PHOF in the acoustics community is critical in both the success of PHOF as a tool, and in demonstrating the impact of noise on society, and the value of good acoustic design more broadly.

3.4   Impact of Covid

The COVID-19 pandemic, and associated lockdown periods, presented unique challenges to the public health sector. Changes in the acoustic soundscape was one factor in the public's experience of the pandemic and their confinement from stay-at-home orders. Broadly, average L_{Aeq} noise in urban areas decreased, for example in London, by 1–11 dB as compared to pre-pandemic levels [23]. This was due to reduced transport and leisure noise as non-essential travel and public leisure activities were prohibited [23, 24]. Where possible, people were encouraged to work from home, converting a generally less stressful home environment, into a more demanding, multipurpose space [25]. Dümen and Şaher (2020) suggest that noise annoyance was more likely to stem from noise within the household, with neighbour noise remaining relatively consistent [25]; whilst Lee and Jeong 2021 suggest that perceived neighbour noise increased significantly, as evidenced by their analysis of survey and social media data [23]. Of the types of neighbour noise, talking and shouting, and TV usage and music playing were the most dominant sources [23]. According to Asensio et al. 2020, daily activity, especially at weekends, started earlier, and ended earlier in the day as public leisure and outdoor activity was restricted [24].

The CIEH survey showed a 54% increase in noise complaints across England from 2019/20 to 2020/21 with a corresponding jump in the rate of complaints for England from 6.4 to 12 complaints per 1,000 population [14].

4   CONCLUSIONS

Indicator B14a in the Public Health Outcomes Framework (PHOF) is a useful reminder that the impact of noise on public health is not solely due to environmental (transportation) noise. It enables local authorities (LAs) to benchmark and compare their own outcomes with other local authorities. LA noise complaint statistics are an accessible and cost-effective input dataset for this indicator. However, low response rates to the CIEH survey are impacting its accuracy. The acoustics community has a role to promote the importance of this indicator, and the importance of LAs to respond to the CIEH noise survey, so that data collection, and thus the value of this PHOF indicator, can be improved.

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