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Exploring the use of interactive data dashboards as a tool to support a data-driven approach to whole-school health improvement: Case studies from the DATAMIND project in Wales and Scotland

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Abstract

School is an important setting for supporting young people's healthy development and positive mental wellbeing. Recent curriculum changes in Scotland and Wales reflect this, adopting a whole-school approach to health and wellbeing as a central pedagogical focus and responsibility of all working in the sector. Alongside education system reform, there is a growing recognition of the need for health improvement decision-making in schools to take a data-driven approach. Interactive data dashboards are data visualisation tools that can facilitate quick information processing and effective decision-making. The Schools Health and Wellbeing Improvement Research Network (SHINE) in Scotland and the School Health Research Network (SHRN) in Wales have been exploring interactive data dashboards as tools for sharing health and wellbeing data with teachers, pupils and parents. This paper explores the views of Local Authority staff, teachers and pupils on the potential application of interactive data dashboards within the school setting to inform health improvement planning. Findings suggest that these offer an accessible tool that could promote

cross-curricular health and wellbeing learning, strengthen the link between home and school life, and engage education and community partners in data-informed health and wellbeing promotion. However, the needs of the school community must remain central in the dashboard design process. Implications for health and wellbeing data-related practices within the school community and future directions are discussed.

KEYWORDS

data-driven practice, digital dashboard, health promotion, school health and wellbeing

Key insights

What is the main issue that the paper addresses?

Drawing on the experience within two school-based health research networks in the United Kingdom, this paper addresses the use of data dashboards as a tool for sharing health and wellbeing data and supporting the implementation of data-driven approaches to health improvement within the school context.

What are the main insights that the paper provides?

The paper highlights the perceived value of data dashboards as an accessible tool to promote the integration of data into school health improvement planning, promote pupil voice and engage education and community partners in data-informed health and wellbeing promotion.

INTRODUCTION

Increasingly, research shows that the psychosocial and physical environment of a school affects the health of pupils and staff (Jourdan et al., 2021; Reiss, 2013). The framework for a whole-school approach to health and wellbeing aims to embed health and wellbeing policies and practices across schools and the wider community to mobilise teachers, pupils, parents and wider partners at different levels for health promotion (HP) (Goldberg et al., 2019). This comprehensive school-based HP model is endorsed by the World Health Organization (WHO) as part of the Health Promoting Schools (HPS) initiative (Langford et al., 2015; World Health Organization, 1996). Research on the HPS approach suggests it leads to improved attainment, increased social and emotional wellbeing and reduced health risk behaviours among pupils (Langford et al., 2015; Patton et al., 2006; Shinde et al., 2018).

With concern about the state of wellbeing in children and young people, particularly after the COVID-19 pandemic (Cowie & Myers, 2021), a whole-school approach to health and wellbeing has become integrated into educational improvement agendas across UK governments. Curriculum for Wales (CfW) has adopted health and wellbeing as one of the six Areas

of Learning and Experience, and supporting 'healthy, confident individuals' is one of the four purposes of CfW (Education Wales, Welsh Government, 2020). Research on the aims of the Welsh reforms, from the perspectives of those involved in designing CfW, suggests a key aim is to give health and wellbeing equal prioritisation alongside 'core' subjects such as mathematics, language and the sciences (Long et al., 2023). Similarly, health and wellbeing are one of three core areas along with literacy and numeracy, which permeate all areas of Scotland's Curriculum for Excellence (Education Scotland, 2017). Both the Welsh and Scottish Governments have published recent guidance on adopting a whole-school approach to mental health and wellbeing (Scottish Government, 2021; Welsh Government, 2021). Similar guidance has also recently been published in England (Public Health England, 2021) and Northern Ireland (Northern Ireland Department of Education, 2021), reflecting recognition of the wider role that schools can play in supporting and promoting young people's health and wellbeing.

Coinciding with education system reform, there is growing recognition of the importance of data-driven practices. The use of data in school improvement planning can offer a data-led approach to decision-making (Mandinach & Honey, 2008). CfW encourages the use of a much broader range of data among schools than attainment and attendance data to support self-evaluation and improvement of a broad range of services and policies (Owen et al., 2023). The National Improvement Framework in Scotland suggests health and wellbeing data are critical for raising attainment of all pupils (Scottish Government, 2023). However, misconceptions around data only being useful for accountability and compliance purposes, or that assessment results are the sole data source schools can draw on (Mandinach & Schildkamp, 2021), create barriers to data-led decision-making in health and wellbeing. Deriving meaning from health and wellbeing data and understanding how it fits within the context of the whole school often require support to access data (i.e., 'data discoverability' Fry & Silva, 2023), interpret data, and implement data-driven change effectively (Widnall et al., 2023). Thus, creating an accessible data infrastructure that school communities can easily engage with, and developing the data literacy skills of the whole-school community beyond assessment results, is a necessary pre-requisite to facilitate data-informed decision-making and practices for health and wellbeing.

Transdisciplinary partnerships between education and health practitioners, academics and policymakers can be a powerful asset in a data science approach to school health and wellbeing (Jourdan et al., 2021; Murphy et al., 2021) but come with challenges. Increasing demands placed on schools, and a lack of understanding from public health researchers and policymakers around existing routines and constraints on schools can result in transdisciplinary partnerships leading to minimal impacts on pupil outcomes (Jourdan et al., 2021). Moreover, the complex systems in which these collaborations exist have been underappreciated in health improvement agendas (Murphy et al., 2021). Reciprocal and mutually beneficial relationships within a systems approach, in which schools' current practices are valued and practitioners can see the contribution that school-based health research can make to their wider improvement agendas, are essential (Hewitt et al., 2018). School-based networks that integrate the knowledge and perspectives of these sectors can provide the optimum setting for generating high-quality and relevant research to inform school-based health and wellbeing practices (Chambers et al., 2022; Widnall et al., 2023).

In 2013, Cardiff University established the School Health Research Network (SHRN) in Wales in partnership with the Welsh Government and Public Health Wales (Murphy et al., 2021). SHRN offers a systems-level infrastructure for strategic research–policy–practice partnerships, which formalise pathways for sharing best practice, facilitate the co-creation of school-based health research and create a network of 'research-ready' schools that are primed to translate scientific evidence into impact at a school level. All secondary schools in Wales are members of this network and are invited to take part in a Student Health and Wellbeing (SHW) Survey every 2 years. Schools receive a SHW Report in pdf

form, which offers up-to-date, school-level health and wellbeing data in order to facilitate evidence-informed health action planning (www.shrn.org.uk). In Scotland, the University of Glasgow, in collaboration with the University of St. Andrews, established the Schools Health and Wellbeing Improvement Research Network (SHINE) in 2018 (www.gla.ac.uk/shine). The SHINE network includes over 770 primary, secondary and special schools, representing 53% of secondary schools and 28% of primary schools across all 32 Scottish Local Authorities, and has established strong partnerships between education partners and public health researchers. SHINE schools can access the SHINE Online Pupil Mental Health (MH) Survey and receive a school-level data report which acts as a vehicle for evidence-based action planning around pupil wellbeing. The report is intended to be shared across the school community, including pupils and families, in alignment with a whole-school approach to wellbeing. Both the SHRN and SHINE networks work in close collaboration with the Health Behaviour in School-aged Children (HBSC) study, a WHO collaborative cross-national study of adolescent health and wellbeing (Inchley, Currie, et al., 2020a; Inchley, Mokogwu, et al., 2020b). In Wales, HBSC provides the core set of variables for inclusion in the SHRN SHW survey and, in Scotland, HBSC data are used to provide national reference data for schools.

In 2022, SHINE developed an interactive data dashboard utilising data from the HBSC study. This interactive dashboard allows users to explore national-level data on young people's health and wellbeing by age, gender, and over time, as well as to compare young people in Scotland with those in other countries in Europe and North America. The dashboard aims to promote classroom-based learning across the curriculum and in wider school activities, and to promote data-informed discussions around health and wellbeing topics within the school setting. The dashboard format aims to address some of the barriers to using health and wellbeing data in schools by providing meaningful summary statistics and easily digestible visuals that can be understood by members of school communities and wider partners with varying levels of skill and expertise (Mandinach & Schildkamp, 2021; Stadler et al., 2016). Since 2018 in Wales, selected variables from the SHRN survey have been shared with Public Health Wales, which has resulted in the development of a public data dashboard that allows users to look at data at national, Local Health Board and Local Authority level. Interactive data dashboards are data visualisation tools which allow users to explore, track and monitor summary statistics in a meaningful way (Stadler et al., 2016) and have the potential to enhance the use of survey data. Dashboards can offer at-a-glance visibility, contribute to reduced workload while engaging with health and wellbeing data and can facilitate quick information processing and effective decision-making. When data visualisation dashboards have been adopted in healthcare settings, they have been shown to greatly improve efficiency in data interpretation and implementation in hospitals (Stadler et al., 2016). Learning analytic dashboards have also been adopted to provide academic feedback directly to students in higher education (Corrin & de Barba, 2015).

Adopting a qualitative, case study approach, this study aimed to (1) explore the perceptions of members of school communities around using health and wellbeing data, including current data sharing practices, (2) access feedback on different types and components of interactive data dashboards, including accessibility and usability of existing dashboards and (3) gather views on the concept of school-level data dashboards as a mechanism for sharing health and wellbeing data in the context of a data-driven approach to whole-school health and wellbeing promotion.

METHODS

Ethics

The study protocol for Wales was approved by Cardiff University School of Social Sciences Research Ethics Committee and the protocol for Scotland was approved by the University

of Glasgow College of Medicine, Veterinary and Life Sciences Research Ethics Committee. Local education authority approval was gained in Scotland before approaching schools and individual participants. Approval to participate was obtained at the school level in Wales. All participants provided written consent, or assent for pupils, in advance of the focus groups. Written parental consent was obtained for pupil participants in Wales and opt-out consent from parents in Scotland.

Study design

A case study design was adopted to provide a more flexible approach in which rich data can be gathered from multiple perspectives from different members of the school community (Goodrick, 2014). Focus group data from the SHINE and SHRN were combined to explore the study aims: current data sharing practices in SHRNs, and the potential impact of a school-level dashboard on the use and dissemination of survey data.

Recruitment/participants

Staff participants in Wales were recruited in two ways. Firstly, seven schools in SHRN had previously been offered funds equivalent to 3 days of supply teaching to facilitate SHW survey completion and other SHRN-related activities. These schools were contacted by the SHRN Manager to invite them to take part in a staff focus group. Five agreed to take part and were asked to nominate up to two members of staff or school governors who were users of SHRN or other school-related data. Secondly, the researchers approached a wellbeing network in a local authority, which held regular meetings for secondary school and local authority staff and cross-school sessions for pupils. Network members were invited to a staff focus group and to identify pupils in their schools to take part in a pupil focus group. Numbers of focus group participants in Wales are shown in Table 1, including job roles of staff and school years of pupils.

In Scotland, the SHINE network monthly newsletter was used to recruit eight schools (four primary and four secondary) from four different local authorities to take part in focus groups with pupils. Teachers and local authority staff members from eight local authorities were recruited via the eight schools, SHINE's teacher advisory panel, and existing network contacts within the local authorities. The number of focus group participants in Scotland is shown in Table 2, including job roles of staff and year groups of pupils.

Study procedure/data collection

In Wales, online focus groups were held between June and October 2022. The focus group sessions were semi-structured and followed an interview schedule covering a number of areas, including current usage and perceptions of the PDF SHW Reports; a demonstration of two existing health data dashboards for schools (the SHINE dashboard of HBSC Scotland data and the BeeWell dashboard for schools in Greater Manchester; https://gmbeewell.org/); and perceptions of the value and potential of a school dashboard for pupils' health and wellbeing data.

In Scotland, face-to-face focus groups with pupils, and online focus groups with school and local authority staff, were conducted between March and May 2023. Pupil focus groups included an interactive session using the SHINE HBSC dashboard. Staff and pupil focus group discussions were semi-structured and followed an interview schedule covering

TABLE 1 Focus group participants in Wales.

Focus group	Participants	Number of schools represented	Number of local authorities represented	Year groups[a]/staff positions represented
Pupil FG 1	7	1	1	Year 9
Pupil FG 2	7	3	1	Years 9 and 12
Staff FG 1	5	3	2	Senior leaders, head of year, subject leads
Staff FG 2	2	1	1	Senior leader, local authority wellbeing lead
Staff FG 3	3	2	2	Senior leaders, subject lead

[a]Year 9 = 13–14 years old, Year 12 = 16–17 years old.

TABLE 2 Focus group participants in Scotland.

Focus group	Participants	Number of schools represented	Number of local authorities represented	Year groups[a]/staff positions represented
Pupil FG 1	7	1	1	Primary 6 and 7
Pupil FG 2	8	1	1	Secondary 4
Pupil FG 3	9	1	1	Primary 7
Pupil FG 4	8	1	1	Secondary 2 and 3
Pupil FG 5	7	1	1	Secondary 3 and 4
Pupil FG 6	8	1	1	Primary 6
Pupil FG 7	8	1	1	Secondary 4
Pupil FG 8	9	1	1	Primary 7
Staff FG 1	3	2	2	Senior leaders, subject lead
Staff FG 2	4	2	2	Local authority staff, head of year, senior leader
Staff FG 3	3	2	3	Local authority staff, senior leaders

[a]Primary 6 = 9–10 years old, primary 7 = 10–11 years old, secondary 2 = 12–14 years old, secondary 3 = 13–15 years old, secondary 4 = 14–16 years old.

perceptions of the SHINE HBSC dashboard, current practices in sharing SHINE MH survey data across the school community, and views on the potential of developing a school-level dashboard for SHINE MH data. Focus group recordings were audio-recorded and transcribed verbatim.

Data analysis

Data analysis was carried out in two phases (see Box 1). First, research teams at Cardiff University and the University of Glasgow analysed focus group data from Wales and Scotland separately. Anonymised transcripts were coded using both 'top-down' and 'bottom-up' approaches (Braun & Clarke, 2006). A priori codes were based on research questions around (1) current use of SHRN/SHINE data, (2) perceptions of the dashboards and (3) potential of a SHRN/SHINE school-level dashboard. Further codes were identified from the data as

analysis progressed. The SHRN team organised the findings in accordance with the research questions, and the SHINE team organised the findings thematically using the Braun and Clarke (2006) thematic analysis model.

In the second phase of data analysis, findings were synthesised based on thematic overlaps. Qualitative synthesis across datasets included identifying areas of synergy and returning to original transcripts in order to clarify contextual issues. Synthesis was facilitated through monthly team meetings where researchers from the two sites shared protocols, discussed ongoing analysis and presented emergent findings. Verbatim quotes from both datasets are used throughout to illustrate key themes, and participants are identified by country, position and individual participant number. Despite the different positions of SHINE and SHRN within the school systems context in Scotland and Wales, respectively, and the slightly different approaches to analyses, findings appeared to be largely consistent across schools. For this paper, findings are organised into three major themes, each containing a number of subthemes.

RESULTS

The three main themes and subthemes identified, with some example codes, are shown in Box 2. Each main theme and subtheme are discussed below, with illustrative quotes from pupils and staff to support the narrative.

Practices of sharing health and wellbeing data across the school community

This thematic area describes perceptions and practices of disseminating data from the SHRN and SHINE health and wellbeing surveys. Discussions centred around two subthemes: 'perceived benefits of sharing data' and 'concerns around system capacity'.

Perceived benefits of sharing data

School staff in Wales and Scotland described a range of benefits of sharing health and wellbeing data with the wider school community. Sharing data with pupils was viewed as an important step in the curriculum planning process as feedback from pupils informed the development of bespoke health and wellbeing curricular activities within the school.

> That's really what informs the curriculum, isn't it? Because we've, for example, the thing about appearance with girls we'd maybe go back to the pupils and ask, what is it about appearance? You get much more detail that way which will go straight back into the planning, so we'll say right, we're going do this lesson, that lesson, and that lesson through the year. You know what I mean? It really does inform the planning
>
> (schoolstaff101, Scotland).

Staff also recognised that the involvement of pupils in data interpretation and the decision-making processes was a key ambition within the Welsh and Scottish school improvement agendas. One participant in Wales emphasised the importance of making data accessible to all potential users, including pupils.

BOX 1 Process of data analysis and synthesis across study sites.

Analytical stages	Cardiff university	University of Glasgow
Analysis of focus group data	Welsh data only	Scottish data only

Coding of anonymised transcripts	• 'Top-down' and 'bottom-up' approaches (Braun & Clarke, 2006)
	• A priori codes based on research questions around:
	  • Current use of SHRN/SHINE data
	  • Perceptions of existing data dashboards
	  • Potential of a school-level dashboard	

Additional codes identified	In accordance with research questions	Findings organised thematically using thematic analysis tool
Synthesis according to thematic convergence	Qualitative synthesis across both datasets included: • Identifying areas of synergy and returning to original transcripts in order to clarify contextual issues • Regular meetings to share protocols, discuss ongoing analysis and present emergent findings • Identification of verbatim quotes to illustrate key themes	

> That's really important to share information and it's a real focus going forward with the Curriculum for Wales now is sharing as much as you can with children. So, it's got to be, it's a no brainer that it's as simple to understand as possible (schoolstaff06, Wales).

Benefits of sharing health and wellbeing data with parent/carers included building trust around collecting and using health and wellbeing data, strengthening the communication between home and school and gaining support for a data-driven approach to health and wellbeing planning. This appeared to be particularly important with parents/carers who were previously unwilling to consent to their child participating in health and wellbeing data collection.

> I think our parents really appreciated the transparency though, because sometimes…. we had a group of parents who were perhaps not even wanting their children to participate in the survey in the first place. So, when we showed them what we use it for and actually that we went back to the children and, you know, can delve a bit deeper and then use that to try to sort problems and address them, they actually quite liked it and they liked the fact that we were being transparent and they liked the fact that it was actually informing our curriculum and our next term
>
> (schoolstaff101, Scotland).

Concerns around system capacity

Although perceptions around data sharing in Wales and Scotland were mainly positive, current data sharing practices were variable, and dissemination of the SHINE and SHRN

BOX 2 Main themes, subthemes and example codes.

Main theme	Subthemes	Example codes
1. Practices of sharing health and wellbeing data across the school community	a. Perceived benefits of sharing data	Facilitating wider access; advantages over PDF format; balance between sharing and privacy/confidentiality
	b. Concerns around system capacity	Need for whole-school data literacy training
2. Pupil access and engagement with a health and wellbeing data dashboard	a. Accessing and interpreting graphical outputs	Support for numerical interpretation
	b. Engagement across the curriculum	Current and potential use of data in core subject areas
	c. Social and emotional learning	Current and potential use of data in PSE curriculum
3. Data-driven practice across the school community	a. Strengthening the health and wellbeing link between home and school	Access options for parents; managing parental expectations; retaining control
	b. Engaging education and community partners in data-informed health and wellbeing promotion	Advantages; disadvantages; training needs
	c. Considering the needs of the school community	Options for learners and others to inform approach

reports was often limited to decisions made within schools at the level of the senior management team. One participant described the need for consistency in action planning as a limiting factor.

> We, as far as I know, (senior leadership) don't filter it down to Heads of Year. Slightly mindful of the fact that people might find too many avenues in too many directions, so we're trying to keep a consistency
>
> (schoolstaff01, Wales).

Staff also noted that additional support is needed for staff, pupils and parents/carers to interpret the data appropriately, 'I think the concerns remain the same, don't they? It's about how the data is interpreted and who it's interpreted by' (schoolstaff203, Scotland) and this can add additional workload for staff with a health and wellbeing remit. The limited sharing of data with pupils also resonated in both the SHRN and SHINE pupil focus groups. Most pupils had never seen the reports prior to preparing for the focus groups.

Staff reflected on weaknesses within the school system itself, such as the capacity of agents (e.g., senior management, teachers, students, community partners) to review, reflect on and use the data, and the need to connect different components within the system in order to share data effectively. Communication between different agents within the system, for example, is key to successful data sharing and enabling data-driven action planning and change. The large amount of data in the SHRN and SHINE PDF reports appeared to be a barrier to this process. Staff described concerns around overwhelming pupils with the reports and their ability to interpret the data independently.

> But it is quite a tough job for [pupils] to go through all of that. They struggle with it, there's just so much
>
> (schoolstaff03, Wales).

This also related to the time pressure teachers experienced when trying to share large volumes of data with the school community, 'there is an element of being compelled to act upon the entire document in a one hour, which is, you know, unrealistic' (schoolstaff203, Scotland). Similarly, there were concerns around potentially alarming parents by sharing the full PDF report. One teacher shared a concern that this could result in unrealistic health and wellbeing targets due to pressure from parent groups.

> I think that parents could get quite alarmed by it, and they want you to act on everything. But I think that if we were able to, to pull out pieces of information, to see that we're going to target this, this and this one almost like have a strategy for parents
>
> (schoolstaff204, Scotland).

In both Wales and Scotland, staff suggested that the ability to share more targeted data with pupils and parents/carers would be preferrable over the full PDF report. During discussions around the data sharing process, a need was identified for capacity development (also known as professional learning and development (PLD) or continuous professional development (CPD)) in terms of data literacy and additional support for school staff in interpreting the data appropriately, particularly when shared with pupils and parents. Some teachers felt a dashboard would support data sharing as it would be 'much more manageable to have it in that format' (schoolstaff101, Scotland,). Despite this, staff in Wales and Scotland were still keen to retain the PDF format. While the dashboard could provide a more accessible and flexible approach, they felt that the PDF report allows a better general overview of the data as a whole which was useful when working within a whole-school approach.

Pupil access and engagement with a health and wellbeing data dashboard

This thematic area covers pupils' experiences of engaging with the data dashboards during the focus groups, and perceptions of potential uses of a dashboard within the school setting. It is presented in three subthemes: 'accessing and interpreting the graphical outputs', 'engagement across the curriculum' and 'social and emotional learning'.

Accessing and interpreting the graphical outputs

Both primary and secondary pupils in Scotland agreed that they felt able to access and interpret the graphical information on the SHINE HBSC dashboard. The simple bar graphs and line graphs were perceived to be the most accessible graphical output for pupils across age groups, and this was reflected in the Wales focus groups too. The clean, uncluttered look of the dashboards seemed to be an important aspect in accessibility for pupils.

> I think the information was really clear, it's nice to have a clear comparison and because there was no information around those graphs it didn't take the attention from them, our full attention was on the graphs, and I think that was really useful
>
> (pupil08, Wales).

Some primary pupils in Scotland needed additional guidance to understand unfamiliar graphical outputs, such as a scatterplot graph. Once explained, pupils were able to engage with the information and enjoyed seeing comparisons between different countries on the scatterplot graph.

> All of these dashboards have been quite good actually; it's been quite good to find out about other places in the world and in Scotland and how we are all different
>
> (pupil305, Scotland).

Pupils in Wales found funnel plot graphs particularly difficult to interpret and this affected their ability to engage with the data. From pupils' experiences, it appeared that the simpler graphs (bar and line graphs) promoted greater engagement with the health and wellbeing data. Within the SHINE focus groups, the dashboard promoted rich discussions around potential influences on health and wellbeing data, differences between groups such as age and gender, and uses of health and wellbeing data in improvement planning. One teacher shared that these data-driven discussions had continued outside of the classroom.

> They absolutely loved it and I've even heard like in the playground, I've heard them talking about statistics and things like that, and as I say, I had a class before I left today and they were desperately asking when we getting to use it again because like, what you're saying, they liked those comparisons
>
> (schoolstaff103, Scotland).

A preference for the online dashboard over a PDF report was also linked to increased digitalisation and the resulting ease of access to online formats, particularly for pupils, as a result of increasing familiarity with the use of digital devices and more ready access to online resources compared with a hard-copy report.

> More people are spending their time online and on computers and things. I think it's just more easily accessible for people of our age, these days
>
> (pupil10, Wales).

Engagement across the curriculum

In Wales and Scotland, participants made suggestions of ways in which the dashboards could be incorporated into school activities outside of traditional personal and social education (PSE) classes. Some suggestions included maths, geography and modern languages as described below.

> On the curriculum for modern languages, and National 5 and Higher [national qualifications] as well, you know health and well-being is one of the topics. So, it'd be really cool to be able to show the kids look, this is where [this country] scores compared to us when we're teaching that topic in the target language
>
> (schoolstaff102, Scotland).

This highlights the potential of cross-curricular engagement with health and wellbeing data. Staff and pupils also suggested uses of the dashboard in school activities such as

assemblies, with health and wellbeing committees, and for creating posters to put up in the school.

> Like if we were doing projects about different topics in school and like making a poster. For example, talking about healthy eating. We could take some of these graphs and present it in a nice way on a poster and these could get put up in school and things like, did you know that girls or boys at this age do this or this? And because it's from a trusted survey it's more like believable and reliable
>
> (pupil104, Scotland).

The feedback from pupils and teachers suggests that the potential uses of data dashboards align well with the aim to incorporate health and wellbeing learning across subject areas as part of the new CfW and the Scottish Curriculum for Excellence.

Social and emotional learning

Pupils saw the potential of using data to understand more about their own health and wellbeing, and the personal relevance of the data was important. Seeing self-report data from them and their school peers was viewed as more interesting and promoted more in-depth discussions around health determinants in their school context. In Wales, pupils felt this could be used in specific project-based academic work such as for the Welsh Baccalaureate, an educational qualification which combines personal skills development with existing national qualifications to prepare students for further study and employability

> In our school they would do tutorial lessons where they talk about things like what is addressed here, eating breakfast and that kind of thing. I think if they could show us the percentages of pupils in our school who were eating breakfast in the mornings or not eating breakfast in the mornings, when they were telling us about it or the other things in here. I think that would be very interesting to give us more of an understanding of how it affects us…But then there's Welsh Bac [Baccalaureate] which sometimes deals with similar things and I think you could use it there as well
>
> (pupil09, Wales).

Pupils also saw the potential of using the dashboard to stimulate data-informed discussions, centred around building awareness and understanding by providing evidence of emotional difficulties, for example, among the pupil population.

> It could be used to show how much people actually do these things, ‘cause some people don't get how much people actually… like having it on this can show people how many people actually go through these things and feel these things, and they can see this
>
> (pupil103, Scotland).

Pupils' experiences of actually using the dashboards in the focus groups sparked discussions around the potential for a data-informed approach to social and emotional learning which incorporated relevant and accessible data into classroom discussions and learning opportunities. They felt that they and their peers could develop greater empathy and understanding for others in the school if they were to view and discuss data on wellbeing, such as loneliness and low mood.

Data-driven practice across the school community

This thematic area describes participants' perceptions of how a data dashboard would impact the use of SHRN and SHINE survey data. Overall, the potential of a dashboard was perceived as an opportunity to increase data discoverability and use across the school community. There were three subthemes: 'strengthening the link between home and school life', 'engaging education and community partners in data-informed health and wellbeing promotion' and 'considering the needs of the school community'.

Strengthening the health and wellbeing link between home and school

Across primary and secondary settings in Scotland, respondents could envisage engagement with a school-level dashboard prompting health and wellbeing conversations between pupils and parents/carers, reinforcing health and wellbeing learning at home and involving parents/carers in the whole-school approach to health and wellbeing promotion

> You could use it as homework opportunities. We're trying to get away from the kind of traditional homework but using it for a discussion like that at home […] it's a lot of it is about setting good habits at home, and what time you go to bed or using your phone or your devices, all these kinds of things. So, if you're giving the children a homework task and it's related to something on the dashboard, then that could get parents accessing it at home, it could promote a family discussion
> (schoolstaff101, Scotland).

This suggests a more novel approach to home-school links, moving beyond the traditional approaches to parent/carer involvement. Staff also suggested that they could incorporate the dashboard into direct engagement with parents/carers, such as consultations or meetings, using the data to facilitate and enhance conversations around health and wellbeing with parents/carers.

> I can see it being really useful to share with certain aspects of it, with parents to open up conversation and dialogue with them, and I'm thinking potentially, you know, at parents' consultations, having a health and wellbeing element to it, 'cause we need to raise the profile with our parents as well'
> (LAstaff301, Scotland).

Pupils in Wales and Scotland suggested that parents would be interested in accessing the dashboard to understand what factors might influence their child's wellbeing, particularly to understand the social and emotional context for different age groups. This data would provide a general picture of young people in their child's age and gender group, rather than targeted data on their child. However, this would have to be managed carefully due to sensitivity of the some of the data and likely variability in data literacy.

> 'It could be useful for parents because they have more than one child in high school because it's showing how it can be like, say from the younger child to the older child. Maybe it shows changes they need to make to keep up with what's happening in schools
> (pupil03, Wales).

Facilitating data sharing with parents/carers through the use of a school-level data dashboard was seen as an opportunity to support data-driven conversations and contribute to the vision of a cohesive culture around health and wellbeing promotion. However, as mentioned previously, school staff talked about the need to manage this carefully and retain control over what information was shared with parents in order to avoid parents feeling overwhelmed or alarmed by the data or creating unattainable expectations in terms of required actions and health improvement targets.

Engaging education and community partners in data-informed health and wellbeing promotion

Participants in Wales and Scotland could see a school-level dashboard facilitating engagement with teachers and partners within the wider community, such as social work, NHS partners, local authorities and educational psychologists. Staff members also viewed the dashboard as applicable to the planning process at a local authority level and could envisage it being used to provide evidence for interventions or targeted provisions

> I've been working with [local authority] and I was thinking these themes can then inform the resources that they then put their money into because the money's kind of getting less and less
>
> (LAstaff302, Scotland).

One teacher suggested the dashboard could help raise the profile of health and wellbeing data among the teacher population and support data-informed practices around health and wellbeing planning within the school.

> I think the staff would be fascinated as well. I can imagine that. In like an in-service day, you know, using some of that information to maybe promote why is it important that we do this in a school, why we look at this data
>
> (schoolstaff101, Scotland).

Feedback also suggested that a school-level dashboard could facilitate independent access of health and wellbeing data across these groups for more focused use and interrogation.

> I think it's only the way forward really, everything is on a dashboard. It gets more people engaging with it, […] It allows people to be inquisitive and follow lines of enquiry and interest
>
> (schoolstaff01, Wales).

The perceptions of research participants in both Wales and Scotland suggest a school-level dashboard could contribute to identifying at-risk groups within the pupil population and a data-driven approach to planning targeted provision. It was suggested that the dashboard has clear potential as a tool to increase data use within the school setting, bringing together key members of the whole-school community (including pupils) to identify priorities for young people's health and wellbeing, inform school-level action planning and health improvement initiatives.

Considering the needs of the school community

It was clear from staff feedback in Wales and Scotland that access was an important consideration in dashboard development. Staff thought that schools should be able to control access to a school-level dashboard. Some staff felt that pupils should be able to access the dashboard as well, but there was recognition that this could be overwhelming if not managed carefully. It was felt that teachers should be able to control what data different users could see on the dashboard

> With students I think it would be, I would choose what they need to see, but governors, definitely, they need to see it all, I think
>
> (schoolstaff05, Wales).

Comparisons with other schools appeared to be another important consideration in dashboard development. The potential for there to be multiple schools on a single dashboard raised concerns around people making unhelpful comparisons between schools. One teacher referred to this as creating a league table.

> You could you run the risk of then headteachers looking at it as a league table and actually the data can then not be used for its intended purpose
>
> (schoolstaff204, Scotland).

Staff in Wales felt that the curriculum agenda was moving away from comparing across schools towards within-school comparisons in improvement planning.

> Well, that would go down like a lead balloon. It's not in line with Curriculum for Wales. Absolutely a no-no to compare with similar schools. We're supposed to be moving right away from that. What you're looking at is schools comparing with what's happened in the past in their setting
>
> (schoolstaff06, Wales).

Some pupils shared concerns around their school data being shown more widely and reflected on the potential impact of this on the school's reputation.

> 'Cause if it's really high then it would give us a bad reputation'
>
> (pupil708, Scotland).

Most of the teachers felt that if there was an intention to share the dashboard beyond the immediate school community, a local authority dashboard would be more appropriate to give the regional context, as opposed to specific schools.

> It could be useful, possibly as a local authority, so that actually we could look at it as a local authority as opposed to nationally. You know, that might be, you know, I think if we were drilling right down to school level as its own says, we could end up with, maybe more questions than we've got answers to give
>
> (schoolstaff202, Scotland).

From discussions in Wales and Scotland, access to the dashboard appeared to be an important consideration in facilitating data discoverability. Providing schools with control of their school-level dashboard, including within-school comparisons, appears to be the most appropriate format for this tool.

DISCUSSION

This paper explored the use of interactive data dashboards within school contexts as part of a data-driven, whole-school approach to health and wellbeing. Findings indicated that school staff, pupils and local authority staff can engage effectively with an interactive data dashboard and consider it a useful tool for schools to use and engage with health and wellbeing data. It appears that health and wellbeing data practices within the SHINE and SHRN school networks are currently restricted in most cases to action planning and evaluation carried out by senior school leaders. Barriers to wider data sharing and more comprehensive data-driven practice appeared to centre around perceived shortcomings in system capacity. Participants envisaged a data dashboard as supporting data-driven practices, system wide capacity development, namely developing data literacy across the school community and improving parent/carer and pupil involvement in health and wellbeing promotion. Participants saw the potential for the dashboard to be used across the whole curriculum and in wider school community engagement. Findings also highlighted needs of the school community, particularly around accessibility, privacy and control, that need to be considered when developing a school-level dashboard.

Previous pilot evaluations of school research networks have highlighted problematic areas around this new data-driven way of working, including the need to grow staff skillset to interpret data accurately and efficiently, management of staff workload, and data sharing with pupils and parents/carers (Chambers et al., 2022; Widnall et al., 2023). From the current findings, it appears these issues remain pertinent in schools' adoption of data-driven health and wellbeing promotion. School staff in Wales and Scotland perceived multiple benefits of data sharing practices. However, concerns around the capacity of school agents to interpret and utilise the full breadth of data available, including the wider staff team, appear to create barriers to sharing practices.

Graph literacy is recognised as a neglected skill among the teaching population (Oslund et al., 2021) and the need to build capacity within school systems around data literacy through relevant PLD and CPD has been discussed in depth (Deahl, 2014; Mandinach & Gummer, 2013; Raffaghelli & Stewart, 2020). The findings point to a need for specific training to enhance data literacy skills among school staff. More widely, the rapid evolution of data collection and use means the public—including young people—need to be supported to develop data literacy skills so they are equipped to engage critically and ethically with data (Wolff et al., 2016). The introduction of technological tools that offer an accessible data infrastructure and aid data analysis are key in establishing wider, more accurate data use. Technological solutions are now required to foster a data driven culture in schools as educators are confronted with a growing amount of complex data to be processed and acted upon (Krein & Schiefner-Rohs, 2021; Sivarajah et al., 2017). Moreover, technology is now well assimilated within the school systems of information sharing, particularly after the COVID-19 pandemic (Osorio-Saez et al., 2021).

Within healthcare settings, data visualisation tools, such as interactive dashboards, have been shown to enable a broader range of users to access data and to gather insights, reduce information processing time and allow clinical practitioners to understand metrics and make interpretations without direct support from data experts (Stadler et al., 2016). Perspectives of school staff around the potential of interactive data-dashboards for engaging school communities in data-informed practices appear to mirror these findings from healthcare research. To enable translation of health and wellbeing data into timely action, the right data needs to be readily accessible. School staff felt the online data dashboard format has the potential to enhance data discoverability by presenting data succinctly for targeted intervention planning at a school and local authority level, promoting a harmonised approach to health and wellbeing promotion. The potential for professionals to discover new

data and follow lines of enquiry was also mentioned, suggesting an increased use of data. It was interesting to note, however, that staff in Wales and Scotland did not feel a dashboard should completely replace the current PDF report format as they felt the PDF report allows a better general overview required when working within the whole-school approach.

Active pupil participation at all stages of health promotion activities, including planning, is a fundamental value within the HPS model (World Health Organization, 1996). By actively drawing pupils into the planning process, they can develop a sense of ownership of the area of learning without which health promotion activities will have little impact on pupils' health-related behaviours or attitudes (Bruun Jensen & Simovska, 2005). The literature suggests multiple benefits of integrating pupil participation into every stage of school health promotion (Bonnesen et al., 2021; Griebler et al., 2017; John-Akinola & Nic-Gabhainn, 2014); however, little has been written on the involvement of pupils in data-driven health promotion practices. The current findings suggest that barriers exist, which often result in minimal pupil interaction with data. It appears that innovative solutions are needed to support active participation of pupils in the interpretation and implementation of health and wellbeing data within the school setting. The findings from this study offer preliminary evidence of successful pupil engagement with interactive data dashboards. Both primary and secondary aged children were able to access, interpret and use the data in health-related discussions (Chambers et al., 2022), which suggests this is an acceptable and feasible format for facilitating pupil involvement.

Building partnerships with parents, carers and the wider community is identified as a key principle in the whole-school approach (Scottish Government, 2021). However, the difficulty of putting this rhetoric into practice is widely acknowledged, particularly at secondary school stage (Baker et al., 2016). Similar to the current findings, previous literature has identified challenges in engaging parents/carers with health and wellbeing data-driven practices (Chambers et al., 2022). In Scotland, teachers saw the potential to use a data dashboard with parents/carers both in direct engagement activities, such as parents/carers evenings, and through dashboard-led discussions at home prompted through homework activities, providing a vehicle to build a more harmonised approach to health and wellbeing learning. Several teachers noted that they would still want control over what data parents were able to access; this appeared to be primarily due to concerns around overwhelming parents with large volumes of sensitive data. It was suggested that the ability to select specific outputs on the dashboard to share with parents/carers and pupils would address this concern. In reality, this has to be balanced with the need to ensure transparency so that parents don't feel that the school is purposefully withholding information from them which could lead to a sense of mistrust and suspicion. Teachers talked about the importance of being honest with parents about the data they collect and how it is used to improve young people's health and wellbeing experiences within the school context.

School staff and pupils could envisage several uses of the dashboard across curricular areas and school life, such as assemblies and health and wellbeing committees. Recent curricular reforms in Scotland and Wales have emphasised the importance of an integrated learner experience working in tandem with the whole school-approach (Scottish Government, 2021; Welsh Government, 2021). However, the increased teacher workload, particularly around lesson planning, has been cited as a barrier to implementing cross-curricular health and wellbeing learning (Thorburn, 2016). If health and wellbeing dashboards are introduced for classroom-based use, it is important to consider how teachers can be best supported to adopt this tool without adding significantly to their workload, such as exemplar lesson plans. Pupils also proposed that dashboard-led discussions could develop pupils' awareness of their own and others health-related behaviours, emotions and social experiences. However, raising awareness among the pupil population about the prevalence of sensitive topics such as mental health without appropriate support in the system to be

able to respond to these issues must be avoided. This is reflected in the whole-school approach framework, with appropriate pathways to support cited as a key principle (Scottish Government, 2021). It is essential that adequate support accompanies such social and emotional learning as to avoid causing unintentional harm.

The experiences of pupils engaging with the SHINE and BeeWell dashboards highlighted the scope for developing data literacy skills through such technology. With some scaffolding, pupils were able to engage with novel graphs effectively. Alongside tools which assist novices in working with data, learner-focussed tools are needed to develop learners' data literacy (D'Ignazio & Bhargava, 2015). The pupil population, in both primary and secondary settings, could engage with and draw insights from the health and wellbeing data dashboards used in this project, with several noting the relevance of the data. Pupils' engagement with appropriately novel graphs and relevant data are important insights garnered from these findings. Future dashboard developments need to consider how pupil, parental and staff data literacy skills can be best supported while retaining the accessibility of the data.

Limitations

The current findings presented have been synthesised across two projects run separately (with collaborations) by SHINE in Scotland and SHRN in Wales. As SHINE has developed a national-level dashboard, the main focus of the research in Scotland was to evaluate this tool and the potential for development of a school-level dashboard. In Wales, the SHRN team gathered insights from the school community to inform future developments of an interactive data dashboard. There were therefore small differences in the focus group schedules in Scotland and Wales (as can be seen in the Supporting Information). Despite these differences, the perspective of school participants appeared to be consistent across Scotland and Wales when discussion topics overlapped, offering important insights into current health and wellbeing data sharing practices and the potential impact of a school-level dashboard on the use and dissemination of survey data. Parents' views were not included and this should be an area for future research.

Future Directions

This paper suggests that a school-level data dashboard can improve the use of health and wellbeing data in the school setting for targeted planning, classroom-based learning and strengthening the home-school ties by facilitating data sharing practices. Notably, this is a relatively new practice for schools and developments, and future research should focus on better understanding how data can be used to leverage systems-level change in schools and improve outcomes for children and young people. In the context of the emergence of a number of new SHRNs across the UK in recent years, this should be accompanied by rigorous evaluations of their effectiveness in facilitating and supporting systemic change in schools and a data-driven whole-school approach to health and wellbeing promotion. The effect of enhanced accessibility and usability of health and wellbeing data across school communities should also be monitored for its impact on data literacy skills and the capacity to influence better decision-making in improvement planning. Any such evaluations should also explore potential unintended consequences, both positive and negative, of the integration of health and wellbeing data dashboards and other such data tools into educational practice. Voices of the whole-school community—including pupils—should remain at the centre of such work to ensure the needs of the school community are met and that research–policy–practice transdisciplinary partnerships continue to strengthen. Finally, there is a clear need

for further training and development opportunities around data literacy for the teaching profession.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

ETHICS APPROVAL STATEMENT

The study protocol was approved by the Cardiff University School of Social Sciences Research Ethics Committee and the University of Glasgow's College of Medicine, Veterinary and Life Sciences Research Ethics Committee. I confirm that the research presented in this article was carried out with due consideration to all relevant ethical issues and in line with BERA's Ethical Guidelines for Educational Research.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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