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Title:

A qualitative exploration of evidence-based decision-making in public health practice and policy: the perceived usefulness of a diabetes economic model for decision-makers.

Key Messages:

- The diabetes model was perceived as beneficial for decision-making in public health
- Implementation of the diabetes model to assist evidence-based decision-making was perceived as problematic
- Organisational constraints linked to limited resource, financial constraints and local priorities impacted decision making
- Stakeholder institutional logics were a potential barrier to the use of evidence from the economic model in public health

Abstract:*Purpose:*

The purpose of this paper is to explore the perceived usefulness of a diabetes economic model as a potential tool for aiding evidence-based decision-making in public health practice.

Methods:

Fifteen semi-structured interviews and two focus groups with four participants each were conducted with health and management professionals working in one public health department in a local council. Data were analysed using inductive thematic analysis to generate four themes.

Findings:

Findings reflect the attitudes and beliefs of a diverse staff group situated in public health services. They demonstrate that the economic model had perceived usefulness, and participants reported positive views regarding the principles of economic modelling for decision-making. The model was perceived as useful but potentially problematic in practice due to organisational constraints linked to limited organisational resources, restricted budgets and local priorities. Differences in the institutional logics of staff working in public health

and stakeholders from local government were identified as a potential barrier to the use of the diabetes model in practice.

Discussion:

The findings highlight anticipated challenges that individuals tasked with making decisions for public health practice and policy could face if they selected to implement an economic modelling approach to fulfill the evidence needs of decision-makers. Previous studies have revealed that healthcare decision-makers would find evidence around the economic impacts of public health interventions useful, but this information was not always available in the context or format required. This paper provides insights into how staff working in public health perceive economic modelling and explores how they consider evidence from a diabetes model when making public health practice and policy decisions.

Keywords:

Decision-making, diabetes, economic model, public health policy, qualitative

Research article:

Background:

Since 2012 local governments in England have been given renewed responsibility for public health services as part of the government's health and social care reforms. The transition of public health from the National Health Service (NHS) to local government was generally welcomed (The King's Fund 2015). Public health teams work with national and local stakeholders to make decisions about local population health policy and practice. However, there is a lack of understanding about what evidence is beneficial in supporting the complex and challenging decision-making processes in the context of public health services (Rychetnik et al. 2002; Grol and Grimshaw 2003; Pentland et al. 2011; van der Heide et al. 2016). A recent systematic review of evidence use in public health decision-making reported a need to understand and respond to evidence needs of decision-makers (Kneale et al. 2017). The review called for a more collaborative approach to decision-making to improve the underutilisation of research evidence South and Cattan (2014) demonstrate the importance of using effective knowledge translation processes to encourage evidence-based public health policy and practice. Decisions are required about how to prioritise services and select actions and interventions that are deemed most effective.

Information and resources have been developed to help decision-makers answer complex questions about 'what works' in improving public health and reducing health inequalities (The King's Fund 2015). There has been an increasing interest in how to determine 'value for money', economic 'return on investment' (ROI) and the use of effectiveness analyses in public health practice (Public Health England 2014). These types of decisions can be informed by economic modelling and a variety of economic tools have been made available to decision-makers, e.g., the NICE Physical activity ROI tool (NICE 2017).

Evidence from economic models can be a valuable source of information for decision-making as modelling provides a framework to evaluate the arguments of the value for money of different options (Drummond et al. 2015). Public Health England encourages the use of ROI and cost-effectiveness tools for decision-making at the local level (Public Health England 2017). Similarly, the Centres for Disease Control and Prevention, and the World Health Organisations promote and provide access to multiple economics tools aimed at public health practitioners (CDC 2017; WHO 2017). However, economic models are not perfect and, in some cases, may not be helpful to the individual decision-maker on the ground (Loveman et al. 2003; Williams et al. 2008; Weatherly et al. 2009). Models often have a specific focus and may use different data sources or assumptions than what is required or available in public health teams (Public Health England 2014). This has resulted in the intended users not being clear about which type of tool and economic evidence is appropriate for their specific context (Public Health England 2014).

Research is limited into the views of those individuals responsible for decision-making regarding how useful evidence from economic models could be in real-world public health contexts (Eichler et al. 2004; Katikireddiet al. 2014; Haddix et al. 2003). Previous studies have revealed that decision-makers would find evidence around the economic impacts of interventions useful, but this information was not always available (Marsh et al. 2013; Marks et al. 2015; Hunter et al. 2016; Willmott et al. 2016).

The purpose of this paper is to explore the perceived usefulness of a diabetes model as a potential tool for aiding evidence-based decision-making in public health practice. The study sought to discover the factors which influenced the models acceptability across different stakeholder groups responsible for public health services for local populations.

The diabetes prevention model

This paper explores the usefulness of a diabetes prevention model which aims to assist in the evaluation of a broad range of diabetes prevention interventions and spending scenarios

across public health services (see appendix A1 for a model summary) (Breeze et al. 2016; Breeze et al. 2017a; Breeze et al. 2017b). This model operates within a spreadsheet where local population data can be inputted and different public health interventions selected to determine a range of potential outcomes. The model could help to inform decisions regarding effective and cost-effective intervention strategies where evidence is strong, and on research gaps and priorities for applied public health research where evidence is limited. The perceived usefulness and transferability of the diabetes model from the academic setting into public health practice is unknown. Therefore, the study sought to address this gap and contribute to the growing literature focused in the domain of evidence-base public health practice (Marks et al. 2015; Hunter et al. 2016; Kneale et al. 2017). It was necessary to determine the likelihood that the model could be perceived as potentially useful for individuals responsible for making local decisions about public health practice.

Methods:

Aim and design

This study aimed to explore the perceived usefulness of a diabetes economic model as a potential tool for aiding evidence-based decision-making within the public health department of one local government organisation. The study adopted a constructivist framework during data collection and analysis as qualitative methods were selected to investigate attitudes, beliefs and meanings of staff regarding an economic modeling approach in public health decision-making (Pope and Mays 2000). Twenty three participants were recruited in total, through 15 semi-structured interviews and two focus groups containing four participants each. Data were conducted between July 2015 and January 2016. The purpose of this paper is to explore the perceived usefulness of an economic model as a potential tool for aiding evidence-based decision-making in public health practice.

The authors considered the economic model as an 'innovation' and therefore drew on current conceptual and theoretical frameworks on the diffusion of innovations to inform the

investigation. One framework, which informed the study was Normalisation Process Theory (NPT) which attempts to identify the issues which affect the adoption and implementation of new innovations within organisations (May 2006, May et al. 2009). During the study the authors explored the idea of using NPT constructs to map the key findings.

Setting and participants

The study was conducted within the public health department of one local government in England, referred to as 'Mardestone'. Mardestone serves a population of approximately 300,000 people. Potential interview participants were recruited using a purposive sampling technique. The interview participants were identified via the research lead working in the public health department. The research lead provided contact details for those individuals responsible for public health decision-making. Each contact was emailed the details of the study and an invitation to participate. To maximise the reach of the sample the focus group participants were identified through attendance at monthly public health committee meetings. Focus groups aimed to include a range of stakeholders from different areas of the council. The committee attendees were emailed and invited to participate in a focus group about decision-making in public health. All 23 participants were involved in public health decision-making and originated from various divisions within the local government organisation, including public-health practitioners/commissioners (PHS) the finance and contracts teams (FC), senior managers/directors in local government (SEN) data and audit analysts (DAT) and elected local councillors, cabinet members (EM) (see Table 1).

<Table 1 about here>

Data collection and inductive thematic analysis

Senior managers in Mardestone approved the conduct of the study in the council building and ethical approval was established. Once consent was obtained the diabetes model was described to participants using a short presentation in the focus group or text-based summary

during the interview. Participants were provided with a hypothetical scenario for two different public health interventions, and were asked to describe their views on how and if they would integrate the evidence from the model into their decision-making practices. A topic guide was generated to help guide the interviews questions and focus group discussions. A copy is provided in appendix A2.

Data collection was conducted by two study authors (XX and XX). Each interview lasted approximately 40 minutes and focus groups 60 minutes. Data were recorded and transcribed verbatim professionally and stored in NVivo 12 data management software (QSR 2016). The study adopted a broad approach to inductive thematic analysis (Braun and Clarke 2006).

Interview transcripts were read and a coding framework was developed to structure codes as they emerged. To ensure reliability of the coding the two study authors coded a subset of the transcripts independently and met frequently to discuss codes and develop a coding frame. The coding frame acted as a thought aid to help structure the new and developing codes as they emerged during the data analysis.

Twenty-three preliminary codes were generated and expanded or collapsed into similar category groups. Each theme was generated through an iterative process of refining emerging ideas and expanding on developing concepts presented in each of the categories (Mays and Pope 1995; Bernard and Ryan 2010). It was important to return to the study aim during the coding and analysis process. Analysis resulted in four themes which formed a complete representation of the data set. To maintain consistency, auditability and credibility, a final cross-check of both authors interpretation with the original data and study aim was conducted to ensure deviation had not occurred between each theme and its meaning (Sandelowski 1989; Mays and Pope 1995; Creswell 2009).

Findings:

Four themes emerged from data analysis: acceptability of the economic model in public health decision-making; a tool in a large decision-making toolkit; the influence of organisational context on model usefulness; and the transferability between professional contexts and institutional logics. In this study, NPT enabled creative thinking about the implementation processes in the local government setting. The theory enabled the authors to make sense of and situate the analytic findings as it helped to structure the way the data was coded and analysed. The final research themes align to the core constructs NPT (See Figure 1). The constructs help to represent the different kinds of issues that participants described when planning to implement the economic model. This process helped to guide the emerging interpretations, conclusions and recommendations of the research.

< Figure 1 about here >

Figure 1. Visual representation of the four thematic findings

Together four themes reflects the attitudes and beliefs of decision makers regarding the usefulness of evidence from the diabetes model. The findings highlight the issues that might promote or inhibit the use of the model in practice, and the contingencies that influence how effectively the diabetes model could be mobilised from an academic setting where it was developed to public health context where it would be used.

Acceptability of the economic model in public health decision-making

The participants generally held positive attitudes regarding the potential use of the diabetes model for evidence-based decision-making in their organisation. Participants considered economic modelling to be a credible approach for solving complex decision problems in public health. As described in the participant quote below:

“This model gives us an intelligent, sensible estimate of what we think will happen, a really good way into that decision-making process. I think Mardestone needs to get into a cycle of evidence-based decision-making. And tools like this are essential for us to make those decisions and change the culture about how we do those kinds of things in the future.” (PHS73)

Data from public health practitioners revealed that they reported to try and integrate research evidence into decision-making processes. It appeared that this was to establish a sense of reliability in the decisions, and to counteract the drive from other stakeholders to make decisions without an appropriate evidence base. A participant from finance and contracts team described this non evidence-based approach to decision making as “*finger in air*”:

“Anything that can give us just more around that analytical side to actually base commissioning decisions, I’d be fully in support of. Everything we try and do is to get an evidence-based approach to commissioning (policy planning), I think it would be really useful if it worked, and people would use it in the correct way and commit their time and resources to doing it. Any evidence that you put into that thinking is always of benefit. So we’re not just going ‘oh a bit of that. There’s a lot of that that goes on, finger in the air sometimes. I think that’s not a healthy approach to things.” (FC74)

Generally, the findings indicate that the diabetes model could generate formal pieces of evidence which participants believed was beneficial to decision-making. An elected member of the council felt that economic evidence could potentially improve accountability and credibility of public health decisions:

“It gives it more credibility, to actually spread it out and get other people using it and buying into it.” (EM83)

Participants described how the evidence generated from the model could provide an opportunity to “*spearhead culture change*” in public health practice, such as planning new strategies (SEN82). However, other participants suggest that these beliefs appeared to be grounded on intuition rather than previous experience of implementing and using similar models to achieve strategic change. As described by the data analysis below:

“I think my gut feeling is that it would work if it was embedded in a broader commissioning or planning strategy or approach. If it was treated on its own or taken on its own, I think it probably be seen as sort of geekish and a bit techy.” (DAT69)

The diabetes model appeared to naturally lend itself to the work of public health decision-makers, as it offered evidence on different public health scenarios and cost returns for a diverse range of policies. A public health practitioner described this as evidence used in “*decisions on where to put the books*”. The evidence generated by the model potentially helped participants tangibly compare the distinct scenarios that were available to them during decision-making.

“As a commissioner any tools that we can use that helps me make decisions on where to put the books is probably a really good thing, it's a good starting point to understand what impacts they have and what, how much in terms of long term or short term savings and then decisions can be made on which way we go.” (PHS81)

However, these positive beliefs about potential usefulness might not necessarily translate into an intention to implement the diabetes model in practice. There were various explanations for why implementation might not be realised linked to local awareness, accessibility and understanding of the model and the prioritisation of diabetes prevention as a disease area within the organisation. These factors appear to restrict the chance that the model would be implemented and used practice. The quote below from a data analysis describes how the diabetes model might not align to the current health prevention schemes and priorities within Mardestone local government:

“It is (useful). But there's a step before that though, in which we actually identify the local priorities for Mardestone which we should channel the financial resources and human resources, and if we identify that Mardestone had a particular problem with diabetes then it probably wouldn't be a problem at all getting ‘by in’ into this tool. But if other conditions were being seen as more problematic... to secure funding and time, limited funds limited time to something where we seem to be mid table rather than in the relegation zone.” (DAT68)

The findings indicate concerns as to whether the model developed specifically for diabetes prevention could align to current or planned local priorities at Mardestone. An independent academic team designed and created the model, and its focus on diabetes appeared to be an obstacle for the participants, as echoed in the following quote from a public health practitioner:

“I think if we’d have commissioned the tool ourselves, we probably wouldn’t have said focus down on diabetes. For us, reducing obesity affects long-term conditions.” (PHS72)

Differences were found in the ways in which national and local issues were framed during public health decision-making at Mardestone. The inconsistency in views regarding the priority of diabetes in particular was an unexpected finding. Diabetes prevention is national priority in the UK and is a current focus of Public Health England (NHS England 2016). A programme of diabetes work spanned many areas of the public health department at Mardestone, including staff responsible for obesity, physical activity and health education. The differences demonstrate a tension in priority setting for either local or national population health and the distinction between the medical and social model of health. The former tends to support a disease specific focus, whereas the latter takes a more holistic view on the wider determinants of health and wellbeing, more typical in local government. In the findings, the specific disease focused model was called into question more so than the usefulness of economic modelling as a tool to support decision-making.

A tool in the large decision-making toolkit

A common theme in the data was reference to the diabetes economic model as another tool that could be added to existing decision-making processes within Mardestone. Therefore, the evidence from the model was perceived as another useful another source of evidence in the mixed economy of knowledge in public health:

“It’s one of the tools in the tool-box for decision making.” (PHS73)

Evidence generated from the model was considered supplementary to existing decision-making practices rather than something that could replace what had gone before. Data suggest that the model would help facilitate better quality decisions compared to other options available. The model evidence could be integrated and used alongside other approaches

during public health decision-making. The discussions focused on how participants could appropriately combine different approaches and types of evidence together to encourage evidence-based decision-making. This finance and contract participant describes decision-making in Mardestone as a “*whole combination of that kind of stuff*”:

“Most of the stuff I’ve worked on, they’ve shown what they’ve done evidence wise, yes consultation exercises, and data. It’s a whole combination of that kind of stuff.” (FC74)

In isolation, the diabetes model was considered limited in its usefulness, this appeared to be due to suspicion regarding the perceived “*black box*” nature of economic modelling methods (*SEN67*). Despite reservations, there was awareness among participants of the need to conduct more formal and structured decision-making process in Mardestone. Economic modelling was viewed as an appropriate approach which could help to generate the ‘hard’ evidence required for public health decisions. The need to consider investment in public health rather than cost effectiveness of interventions is relatively new in this environment and could be a product of austerity. The public health practitioner below describes the necessity to determine a “*return*” on investment within public health practice at Mardestone:

“So we need to provide a case for the services we’ve commissioned. We need to monitor the effects of our interventions so that we can look at the monetary value of what we are doing. We are not just spending money, this is a return.” (PHS72)

The findings revealed that the usefulness of the model could be facilitated through promotion of it as part of the decision-making toolkit. In this sense, the diabetes model could provide decision-makers with an additional source of evidence for consideration. Evidence from the model would need to be explained to decision-makers and compared alongside other considerations. Public health policy and practice decisions in Mardestone required mixed knowledge from a variety of stakeholders, including those with experience in other areas of local government decision-making such as social care services. It maybe necessary for public health practitioners to ensure that evidence created an economic modelling approach was

appropriate in the local context and aligns to the processes of decision-making in their environment.

The influence of organisational context on model usefulness

Participants reported a range of organisational factors which potentially limit the usefulness of the diabetes model in practice. Particular difficulties related to the perceived implementation problems on the ground, and the ‘fit’ of the model to local context, skills and resources. The problems identified are not new and have been reported elsewhere, however they provide an important understanding the context of local government. There was a presumed lack of flexibility and appropriateness of the model in the context of public health decisions. Participants described prominent barriers linked to financial constraints, economic pressures and resource challenges. Practical considerations included the potential availability and capability of local staff to use the model to its full potential, and their technical capacity and expertise to operationalise the model and interpret the outputs. One data analyst reported “*lacking sophistication*” and modelling “*capacity*” in their department which suggests a ‘front end’ interface would be required to make the evidence usable in practice:

“We just lack the sophistication to be able to do it. Very few places would have the capacity to be able to take the time to do that kind of work. I don't think we do it now because we haven't got the capacity, we haven't got the time, and we haven't really got the skills, there aren't sophisticated modelers. Modelling tools will play an increasingly important part in what we do, but the ability of us, having a team big enough to create those models is decreasing.” (DAT69)

Other participants perceived their lack of skill meant they would not be able to confidently mobilise the results and evidence from the model into practice. This public health practitioner described not being “*qualified*” in a “*mathematical discipline*”:

“I'm not qualified to say how good the tool is and what it does, you would have to take advice from somebody who understood how the modelling was done which I assume is the mathematical discipline, which I'm not.” (PHS80)

To overcome this challenge it would be important to tackle some issues regarding decision-making using an economic modelling approach that were identified in the study. One reported problem was the localisation of the model to support evidence-based decision-making processes in local government. Participants described the need to have an organisationally specific model to ensure its success in context, for example lifecycle data and outputs from their projects should be incorporated into the model before it would be perceived as useful in practice:

“My main involvement has been to try and Mardestone-erise it (the model). When we were presented with the tool we were presented with a set of data that were based on generic or national populations. We felt the first thing that was quite important if you were going to get it to be useful, you had to make it Mardestone specific.” (DAT69)

Participants reported the need to be able to justify adopting a modelling approach to senior decision-makers. This staff member states that it would be essential to “*convince our governing body and senior management*” that the model would be a positive investment in Mardestone:

“The key challenge would be convincing the governing body to do this rather than do something else. We've got limited funds, if there was a financial impact we'd have to justify spending it on this tool. Would there be any financial implications, would it cost us anything, how much staff time? It would be convincing our governing body and senior management team that any financial or time that was required to be spent on this model was worthwhile.”(DAT68)

The findings revealed a strong influence of a hierarchical structure within the public health department and wider local government in Mardestone. This organisational norm impacted on the decision-making process and centered decisions around the opinions of individuals, not what was presented in the evidence. As represented in the quote below:

“Local authorities are very much more hierarchal, we have an electoral system. We would write a report, it would be based on evidence, you'd have done everything right, and normally everything would be based on that. Here it can change because of an individual's view. And that's the system that we work in. Decisions made have to go through a process, we have to present the information and then decisions are made.” (PHS81)

A variety of organisational constraints were reported as impeding the potential usefulness of the model in practice, for example budget cuts within local government and balancing priorities across the organisation. Concerns were raised regarding the ‘fit’ of the model in context because it did not align to the organisational view of timeliness. The findings demonstrated a desire to achieve instant results from decisions as opposed to planning longer-term time horizons for outcomes of investments. The participant below suggested that stakeholders would not be prepared to wait for the outcome of policies that the diabetes models suggested were the most appropriate:

“Sometimes people demand results. I can understand where they are coming from but some things don’t get results really quickly. Part of that is a bit of culture change in terms of what people can expect.” (PHS73)

Participants working in Mardestone revealed they had little control and authority over many organisational decisions due to the significant budget cuts within public health and the wider local government. This restriction limited what decisions they could action “*even though it might be the right thing to do*”. As described in both examples below:

“Yeah and budget constraints. You know if it’s too expensive it might not happen, even though it might be the right thing to do.” (PHS73)

“I think the biggest issue we’re going to have is more cuts. So we’ll see how it goes after next year’s budget.” (EM83)

There was an understanding that evidence-based decisions which potentially save money, might still be the ‘wrong’ decision in the context of broader organisational politics. The public health practitioner below refers to this as the “*political agenda*”:

“That comes back to funding and what the political agenda is at that time, it constantly changes. Everything can’t be a priority obviously, but then they are looking at the figures that you really plough money in and plough resource in that obviously comes down as a problem, but then you’ve got something else in the meantime so you’re constantly trying to balance them.” (PHS80)

This represents a separation between decision-making that privileges evidence from evidence-based sources, such the diabetes model and those which focus on the political agendas of an organisation and opinion leaders. In public health policy and practice, the usefulness of an economic model as an evidence generating mechanism must be considered in the context of all these locally contingent factors. Assuming the model would be fit for purpose at one level, for example by providing training to an individual data analyst, may not be sufficient to ensure that the output and evidence generated from the model will be influential and acceptable in decisions made across the broader organisation.

Transferability between professional contexts and institutional logics

The competing norms and institutional logics that were present in the public health services at Mardestone local government reflect the wide range of stakeholders who are responsible for making decisions about public health policy and practice. In this study, the differing institutional logics appeared to impact the perceived usefulness of the diabetes model for facilitating evidence-based decision-making. Public health practitioners, who originated from a healthcare environment, tended to subscribe to the norms of clinical science which underpins evidence-based medicine. Other participants working across the wider remit of the local government, such as social care or management sector did not subscribe to the logic of clinical science in the same way (Dunn and Jones 2010). The perspectives and logics of different individuals did not always align and therefore complicated decision-making processes. This participant from finance and contract describes the different approaches to decision-making between staff at Mardestone:

“Public health, what they bring is a kind of education scholarly approach to things, and that’s different. That’s very much evidence-related and population, because that’s the nature of public health. Whereas social care sometimes are not so evidence-based-led. It’s a bit ‘well I thought that’ more fly by the seat of your pants in social care.” (FC75)

This quote illustrates the way in which decisions makers tended to stereotype individuals into different groups relative to their professional background, for example stating that public

health practitioners are “*very much evidence-related*”. Despite these beliefs the differences were not clear cut. All decision-making included those in public health department required a mixed economy of knowledge to make decisions within the local government context as described below:

“We would look at all the evidence, look at all the data, look at best practice elsewhere, and then we would go and consult with the community in some way.” (PHS81)

The findings revealed that participants not subscribed to a science logic consequently did not privilege evidence-based medicine in the same way as public health practitioners. The perceived value of the evidence generated from the diabetes model was limited because it aligned to the traditions of evidence-based medicine. The diverse views from the range of participants across the organisation could not seamlessly integrate into the day-to-day decision-making practice of the public health department, as described below by the public health practitioner:

“I am not sure evidence is valued in the same way in the local authority even though I think it is in public health. For example I might consult with ten people in the community and they say this intervention is a really good idea. They might put more sway on those ten people than something that’s had loads and loads of work gone into it and is really objective.” (PHS72)

One public health practitioner illustrates how an evidence-based approach would normally be followed as an “*automatic go to*” in public health decision-making processes prior to public consultation (PHS81).

The findings question the acceptability and appropriateness of evidence from an economic model grounded in traditional evidence-based medicine and the logic of clinical science for use public health decision-making. In local government and public health services, evidence is required for decision-making but the diverse views of stakeholders meant that definitions of evidence were not concrete or agreed upon. Evidence could constitute output from the diabetes model or the experience of an individual member of the organisation. Participants

reported that different types of evidence would be used in combination, and the point at which each type became important varied amongst participants depending on their prevailing institutional logic. The data analyst described how decisions may change depending on the individuals involved:

“You start with the best evidences available and you build up what you're going to do based on that, talk to the various experts around the room. Once you've done that you've got to go to the elected members, and say this is what we want to do and they will possibly say 'well yeah that's all very well but what's it going to do for (our local) community'. We don't tend to start with the evidence, build it up. So I suppose it's a very indirect way of saying, this kind of evidence base which is part of an evidence base, is kind of muddled.” (DAT69)

The way in which the different types of evidence were brought together during public health decision-making was flexible. Decisions sat firmly in the domain of contextual practice where the focus was on the local circumstances and the ‘fit’ of decisions for the local population of Mardestone. Therefore, evidence from the diabetes model was perceived as useful and appropriate if it could fit within the current context in which decision-making occurs. However, a changing decision context could potentially impact the usefulness of the model in the future.

Discussion:

Decision-making for the selection of public health interventions and local population services has been described as complex and challenging process (Rychetnik et al. 2002; Grol and Grimshaw 2003; Pentland et al. 2011; van der Heide et al. 2016). This study sought to explore the perceived usefulness of evidence from an economic model for type 2 diabetes, as a potential tool for aiding evidence-based decision-making in public health practice. Public health services located within local government in England provided a novel opportunity to investigate the types of evidence and approaches to decision-making prominent in this environment. Findings revealed four themes which reflect perceptions about the usefulness of an economic modelling approach and the diabetes model from a diverse group of participants. The challenges identified would promote or inhibit the use of the model were

described, along with the contingencies of practice that might influence how effectively the model could be mobilised from the academic domain where it was developed into the public health department where it would be used to inform policy and practice decisions.

Generally positive views were identified regarding the potential contribution of evidence from the diabetes model to public health decision-making. Modelling is an approach that could provide the 'hard' evidence to justify decisions in this complex environment where many competing positions and ever-declining budgets exist. Factors which could potentially hinder the implementation and use of the model in practice included; availability of staff with suitable knowledge and experience of modelling, staff with technical skills to ensure effective use of the model coupled with the ability to confidently promote the output to senior decision-makers at Margate. The hierarchical structures of Margate's decision-making processes and the existing service priorities and provisions across the local council were also problematic. The themes identified in this study have been documented in a variety of settings (Gkeredakis et al. 2011, Powell et al. 2017), although not focus on public health in local government settings. Walter and colleagues described the importance of the interactions between researchers and research users, and the need to provide a supportive context to encourage research-based practice (Walter et al. 2005).

The focus of the model on diabetes did not always align to the service priorities within the council as participants described the need to focus attention on obesity in their service. This demonstrates the importance of developing an economic model in partnership with council who are responsible for making local decisions. Organisational resources, in particular the financial and budget restraints were also a limiting factor in whether the model could be considered appropriate. Financial issues restricted the potential decision options regarding interventions which may not be viable in the future, and made managers of the local government cautious of committing staff time to analytical work not seen as a priority. This finding supports previous research which found that organisational factors impacted on the

success of interventions aimed at increasing research use in public health policy decision making (Zardo et al. 2015)

The transition of public health to local government in England, has interrupted the flow of research evidence into practice and heightened the political element to decision-making, allowing it to be more visible and localised (Kneale et al. 2017). This raises debate regarding the boundaries between public health and politicians, where the former appear to argue for a superior evidence-based method compared to the diverse sources of evidence privileged by other stakeholders. Contrary opinions on the best course of action reflect the differing objectives and priorities of individuals working in public health and demonstrate the challenge of integrating economic models grounded in evidence-based decision-making. It is possible that the boundary between decision-making norms and processes could be bridged to facilitate collaborative decision-making, economic models and the evidence they produce could be a fruitful area to pursue. However, the negative perceptions about the model identified in this study would need to be tackled first, for example the belief that it was not or could not be tailored to local circumstances and priorities. Increasing awareness of the aims and methods of economic modelling across all stakeholder responsible for public health decisions might help address these challenges as some views were supported by instinct as opposed to experience of using the model and its output.

Participants reported potential problems in using the model in practice because it might not align and support the preferred approach to decision-making at Mardestone, where local views and political agendas were prioritised over other forms of evidence. This appeared to be a consequence of the legacy decision-making norms within the organisation and differing institutional logics of individuals working there. According to Scott et al (2000), institutional environments may influence organisations through the 'archetypes they develop for actors, the logics they legitimate, and the governance systems and rules they support'. This study found competing views between public health practitioners and other public health decision

makers (e.g., finance and contracts) regarding how decision-making does or should take place in public health policy and practice, and whether evidence from the model could ‘fit’ into the current approach. Disparities reflect the implicit and socially shared rules that existed for the participants regarding what acted as legitimate sources of evidence for them in their decision-making, and their differing objectives and priorities for local government policy (Greenwood et al. 2002). Evidence sources included clinical evidence and national population data, and the views of small groups in the local community or output of larger consultation exercises. The perceived usefulness of the model outputs as a source of evidence was inhibited because it did not align with the dominant logic of decision-makers within Margstone (exemplified in respondents’ narratives within the social care teams).

A central finding was the importance attached to the local context in public health decision-making at Margstone. Public health decisions made in this complex setting required health and social care priorities to be considered, but they were not linear or straightforward, and therefore tended not to be made using crude parameters of success. This echoes a recent study by Fitzgerald and colleagues (2017), which demonstrate that public health data and statistics were not valued or understood by individuals responsible for generating public health policy. In this participants study required multiple sources of evidence during decision-making, including evidence from academic and traditional evidence-based sources, local populations and individual experiences. The outputs of the diabetes model were another source of evidence to be added to this mixed economy of knowledge in public health decision-making. The findings support recent research which promotes the combination of multiple types of evidence in public health policymaking (Cairney and Oliver 2017). Decision makers must recognise that traditional evidence-based approaches may not always be appropriate in the context of public health and local government, and therefore approaches such as economic models might not transfer from one context to another.

Implications for research and practice

Public health policy and practice decision-making consists of various ‘wicked problems’ as those tasked with making decision are faced with long time horizons, complex systems of causation and unclear responsibilities spread across multiple stakeholders. This study sought to discover whether and how evidence from the diabetes model might fit into the decision-making toolkit used in public health. What became clear was that there was no ‘right’ way in which the differing ideals regarding the process and practice of decision-making were negotiated. Evidence from the economic model was perceived as a valid source of evidence for public health decision-making, however it did not substitute evidence from other decision-making tools and approaches. Instead, the model was perceived useful in the promotion of more structured decision-making processes within the current unstructured, complex and changeable environment.

It is important to recognise the need to improve the health of the public by engaging in a much wider spectrum of planners and decision-makers. This requires going beyond those who typically label themselves as public health practitioners and therefore have perceived responsibility over decisions. The findings highlight the highly politicised nature of commissioning within local authorities and contribute to the growing literature of implementation science. The study emphasises the dichotomy between functionalist, practical and materialist explanations that have dominated previous implementation science research, compared to the focus here on the more subliminal, latent and hidden dynamics and agendas driving action. This is not to deny that the explicit measurable drivers are important, but to argue that the implicit and less measurable ones are important too.

In this study, the majority of public health practitioners were previously been located within healthcare where economic modelling and evidence-based medicine were customary. Participants from outside of health held differing views, and their dominant evidence source changed depending on local priorities of Mardstone. This inherent flexibility limited the potential usefulness of the diabetes model, as it was not automatically valued as applicable to

all the needs of decision makers. A key message is the need for transparent decision processes, so that individuals with differing ideals are able to communicate and share views about what they consider to be important evidence for decisions and why it should be considered over other options. Individuals working in public health within local government may choose evidence from economic models to help guide planning and investment decisions, but they need to be communicated and discussed with all those responsible for decision-making. To extend the findings of this study, an investigation into the implementation of the diabetes model and impact that it has on decision making is required. This is an area for future research, which may help to ensure that decisions made for populations are based on considerations of the best available evidence.

Strengths and limitations

This investigation is one of the first to examine the perceived usefulness of a diabetes economic model specifically in the wider public health local government setting. The findings presented and discussed demonstrate the increasing need to understand the factors that influence acceptability of economic models in real-world contexts. The study provides a useful insight to researchers and practitioners who aim to promote the use of this type of evidence in their work. A limitation is that the study included participants responsible for public health decision-making within one organisation (Mardestone). The authors recognise that participants were describing decision-making for public health and that local governments have wide ranging responsibilities outside of health. The findings may be contingent on this restricted view and could be improved by sampling further into the organisational infrastructure.

It was essential to provide significant depth of investigation (rather than breadth) but the single case generates questions regarding generalisability of findings. Findings may not feasibly be compared elsewhere, due to the diversity in terms of political orientation, organisation and skills of public health teams and local public health issues being tackled at

Mardestone. However, understanding generated through this study of evidence-based decision-making using evidence from the diabetes model has strong internal validity, therefore it has wider generalisability at a higher conceptual level. This paper has discussed whether evidence from an economic model can ever be appropriate for public health practice, where multiple stakeholders spanning larger disciplinary boundaries are responsible for decision-making regarding the health of the population. The study aimed to provide significant contextual detail of the decision-making processes so that others could identify with their approach to practice. Therefore, encouraging the uptake of evidence-based approaches to decision-making for those working in public health.

Conclusion:

The diabetes model had perceived usefulness and participants reported positive beliefs regarding the principles of economic modelling for decision-making in public health. However, the potential implementation of the economic model to assist evidence-based decision-making in practice was perceived as potentially problematic, due to organisational constraints linked to limited resource, finance and local priorities. Differences in the institutional logics of individuals working in public health in the local government context was identified as a potential barrier to the use of the model in practice.

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Declarations

List of abbreviations:

DAT	Data and audit analysts
EM	Elected member/cabinet members
FC	Finance and contracts teams
NHS	National Health Service
NPT	Normalisation Process Theory
PHS	Public-health practitioners/commissioners
ROI	Return on Investment
SEN	Senior managers/directors in local government

Ethics approval and consent to participate:

All participants gave consent to participate in the study and for their data to be included in the analysis and reported on via publication. No individual personal data is included in the paper. All participants and organisations are anonymised. Mardestone County Council agreed to participate in the study and ethical approval was granted by the local University Ethics Panel (ref:002577).

Consent for publication:

All participants provided consent for publication.

Availability of data and materials:

The dataset is not made publicly available due to confidentiality reasons.

Competing interests:

The authors declare that they have no conflicts of interest.

Authors' contributions:

Removed for blinding

Acknowledgements:

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Supplementary appendix

A1. A brief summary of the model

Return on Investment Modelling

Mardestone Weight Prevention and Management: Draft Report for hypothetical analysis

Introduction

The prevalence of overweight and obesity across Mardestone is considerably higher than the England average. Mardestone Council is providing a range of evidence based interventions driven by local need and incorporating best practice in order to halt the rise in obesity. Tier 1 and Tier 2 weight prevention and management services have recently been commissioned.

This exploratory study aims to evaluate the return on investment of a selection of services recently commissioned based on their contracted cost and targeted weight outcomes. The analysis will provide estimates of the long term benefits of these policies conditional on alternative targets to inform ongoing evaluation of services and future re-commissioning.

Method

The Model

The model was developed to forecast long-term health and health care costs under alternative scenarios for diabetes prevention intervention. The evolution of individual-level trajectories, rather than aggregate characteristics of a cohort are simulated through a micro-simulation framework. The model was designed to simulate a representative sample of the UK population. For each person, their weight, cholesterol levels, systolic blood pressure and HbA1c (a measure of diabetes) fluctuate from year to year, representing natural changes as people age. Individuals can develop diabetes, cardiovascular disease (e.g. heart disease or stroke), diabetes-related complications, cancer, depression or osteoarthritis over the course of

their lifetime. Each disease results in a particular cost to society and a reduction in quality of life for the individual. The model was developed in freely available statistics software, R, which allowed fast and flexible simulation of patient outcomes.

The Population

The baseline characteristics of individuals in the model were generated to be representative of the Mardestone Adult population. The Health Survey for England 2011 dataset was used to describe individual characteristics needed in the model and to ensure that correlation between characteristics (e.g. smoking and systolic blood pressure were maintained). A stratified sampling algorithm was developed to select individuals from the Health Survey for England to be more representative of the Mardestone population.

The baseline characteristics of individuals are described in Table 1.

Table 1: Characteristics of final sample from HSE 2011 (N=8038)

	Number	Percentage	
Male	3506	43.6%	
White	7212	89.7%	
Indian	188	2.3%	
Pakistani	126	1.6%	
Bangladeshi	41	0.5%	
Other Asian	90	1.1%	
Caribbean	71	0.9%	
African	115	1.4%	
Chinese	35	0.4%	
Other	160	2.0%	
IMD 1 (least deprived)	1700	21.1%	
IMD 2	1699	21.1%	

IMD 3	1696	21.1%	
IMD 4	1479	18.4%	
IMD 5 (most deprived)	1464	18.2%	
Non-smoker	4310	53.6%	
Past smoker	2105	26.2%	
Light smoker (<10 per day)	589	7.3%	
Moderate smoker (10-20 per day)	683	8.5%	
Heavy smoker (>20 per day)	342	4.3%	
Anti-hypertensive treatment	2092	26.0%	
Statins	665	8.3%	
Stable angina	135	1.7%	
Unstable angina	42	0.5%	
MI	78	1.0%	
Stroke	179	2.2%	
	Mean	Standard deviation	Median
Age	48.59	18.49	47.00
BMI	27.13	5.18	26.40
Total Cholesterol	5.42	1.07	5.40
HDL Cholesterol	1.53	0.44	1.50
HbA1c	5.61	0.47	5.60
Systolic Blood Pressure	125.90	16.92	123.50

EQ-5D (TTO)	0.836	0.232	0.883
BMI Body Mass Index; IMD Index of Multiple Deprivation; EQ-5D 5 dimensions Euroqol (health related quality of life index)			

The Interventions

The hypothetical analysis considered a weight prevention and weight management intervention.

Weight Management

The intervention was assumed to recruit 500 individuals in the population at random with a BMI > 30. Individuals attended an educational session on weight loss. In the first year the individuals experienced a reduction in BMI of 1 kg/m². The benefits of the intervention were assumed to reduce linearly over a five year period. The intervention was assumed to cost £200 per individual in the first year.

(In final analysis will produce summary statistics of baseline characteristics for individuals meeting the intervention criteria)

Weight Prevention

The intervention was assumed to promote a low fat diet through poster campaigns in the workplace. The posters were assumed to be seen by 5,000 individuals in employment selected at random. In the first year the individuals who saw the posters experienced a reduction in BMI of 0.05 kg/m². The benefits of the intervention were assumed to reduce linearly over a five year period. The intervention was assumed to cost £2000 in poster development, printing

and distribution costs.

(In final analysis will produce summary statistics of baseline characteristics for individuals meeting the intervention criteria)

The Outcomes

The model estimates a number of short and long term outcomes to describe the long term benefits of an intervention and to allow comparisons across policies. An interactive excel spreadsheet has been developed to enable flexible generation of evidence. Each outcome can be viewed at different timescales in years. The analysis also allows the user to view outcomes assuming the intervention meets the target for effectiveness, exceeds, or falls short of the expected outcomes.

The SPHR model generates a number of cost outcomes including net cost total NHS cost savings and net cost savings (Intervention cost minus NHS cost savings). The NHS costs can be broken down by costs attributed to cardiovascular disease, diabetes management and cancer.

Health outcomes include life years, Quality Adjusted Life Years, cardiovascular disease, and Diabetes diagnoses.

The model also estimates the net monetary benefit of the interventions, assuming a willingness to pay threshold of £20,000 per QALY. This allows each intervention to be compared against a single measure of overall cost and health benefits. All costs and QALYs are discounted at 1.5% in line with national guidelines.

Results

First, the model evaluates the long term cost in a scenario 'do nothing' scenario in which no individual health trajectories are altered. The model also evaluates the same individuals health trajectories under a weight prevention and weight management scenario in which the health

trajectories of a sub-group of individuals are modified.

Costs

The cost differences between each intervention and the ‘do nothing’ scenario are described below.

Table 2: A comparison of costs for a population (N=70000) in which some individuals are affected by two policies

	Weight Manageme nt	Weight Prevention				
	1 year	5 year	10 years	1 year	5 year	10 years
Intervention Coverage	0.7%	0.7%	0.7%	7%	7%	7%
Intervention Cost	£100,000			£2,000		
Diabetes Cost	£0	-£545	-£5,350	£0	-£165	-£2,091
Cardiovascu lar Cost	-£229	-£7,397	-£18,399	-£73	-£350	-£567
Cancer Cost	-£1,225	-£1,935	-£1,935	£732	£732	£732
NHS Cost	-£1,894	-£26,582	-£57,115	£378	-£6,455	-£15,477
Net Cost	£97,771	£76,288	£49,252	-£1,621	-£4,456	-£13,478

In the first 1 year of follow-up the weight management interventions costs £100,000 to implement, and enrolls 0.7% of the population. In the following 10 years the NHS is expected to accrue over £50,000 of savings. However, over 50 years the savings do not exceed the cost of the intervention. In the first 1 year of follow-up the weight prevention interventions costs

£2,000 to implement, and enrolls 7% of the population. In the following 10 years the NHS is expected to accrue over £15,000 of savings. After only 1 year the savings to the NHS exceed the cost of the intervention.

Health gains

The differences in health between the ‘do nothing’ scenario and the two intervention options are summarised in Table 3.

Table 3: A comparison of health for a population (N=70000) in which some individuals are affected by two policies

	Weight Managem ent	Weight Prevention				
	1 year	5 year	10 years	1 year	5 year	10 years
Intervention Coverage	0.7%	0.7%	0.7%	7%	7%	7%
Diabetes Diagnosis	0.00	-1.12	-2.45	0.00	-0.28	-1.26
Cardiovascu lar disease	-0.07	-0.84	-1.54	-0.14	-0.28	-0.28
Life Years	0.00	0.28	1.82	0.00	0.28	0.77
QALYs	0.10	1.21	3.74	0.06	0.48	1.12

Over 10 years the weight management intervention prevents more than two diabetes diagnoses and more than 1 incidence of cardiovascular disease. Approximately two life years are gained and almost four QALYs.

Over 10 years the weight prevention intervention prevents fewer poor health events than the

weight management campaign. The rate of diabetes diagnoses and cardiovascular disease incidence are marginally reduced. Approximately 1 life year and 1 QALY are gained across the population and 10 year time horizon for this population.

Net Benefit

The total Net Benefit of the interventions valued at £20,000 per QALY is summarised in Table 4. This analysis illustrates that the weight management intervention is not good value for money until after approximately 10 years. Whereas the weight prevention intervention is good value for money from year 1 onwards.

Table 4: A comparison of net benefit for a population (N=70000) in which some individuals are affected by two policies

	Weight Manageme nt	Weight Prevention				
	1 year	5 year	10 years	1 year	5 year	10 years
Intervention Coverage	0.7%	0.7%	0.7%	7.0%	7.0%	7.0%
Incremental Cost- Effectiveness Ratio	£966,915	£62,795	£13,168	Cost Saving	Cost Saving	Cost Saving
Net Benefit	-£ 95,749	-£ 51,991	£ 25,554	£ 2,746	£ 14,102	£ 35,845

A2. A copy of the interview topic guide

Topic Guide

Adoption and implementation of a diabetes prevention model to inform local government commissioning

Context of decision making for public health

What is your understanding of who makes the health and well being prioritisation decisions in Mardestone?

- What is the role of the cabinet?
- What is the role of the council?
- What is the role of other partnerships/CCGs?
- What is the role of the HWBB?
- Role of HWBB in priority setting
- Influence of public health v other professional groups

What are the key public health priorities identified for Mardestone?

- How were priorities decided on?
- Have these priorities been identified as part of a strategy?
- How have the Marmot recommendations been addressed by Mardestone?
- What are the key strategies in place?
- Have action plans been agreed on how the priorities should be reached?
- How does type 2 diabetes compare to other health/public health needs/problems?
- How does type 2 diabetes affect the local population?

What evidence is required to help commissioning decisions/resource allocation in relation to type 2 diabetes?

- Are they influenced by evidence? Explain.
- How could commissioning be improved/changed?

Attitudes towards innovation in Mardestone

- What tools are currently used for PH decision making?
- What is the level of understanding around priority setting held by key stakeholders?
- Beyond the overarching priorities which areas present a challenge in relation to resource allocation, or making difficult trade offs?
- How have decision tools/models helped/hindered the process?

In your view which tools are useful for prioritising PH investment and why?

- How could the ROI tool be used to inform priority setting around type 2 diabetes services?
- What type of evidence could such a model provide to enhance decision making? eg. Longitudinal, forecast health burden (predictors?), population needs etc?

How acceptable would such a model be in Mardestone?

- Could it be used by staff/why/how?
- Could it have broader utility?
- Who could use it?
- Is the organisation/culture receptive to innovation?
- How could the tool be used in routine commissioning decisions/work at Mardestone?

Specific enablers and barriers to adoption of the tool/new innovations

- The ROI modelling tool?
- How could any barriers be overcome?
- Who is most likely to adopt the tool?
- Does it make sense (coherence) to use the tool in the way it was designed? Why? How?

- Will other employees adopt the tool?
- How much visibility has the tool received in Margestone Council? What is the effect of tool visibility/invisibility? Eg collective (in) action.
- Could the tool be extended beyond diabetes? Explain.