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Article

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Industry influence on public health policy formulation in the UK: a complex systems approach

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Abstract

Unhealthy commodity industries (UCIs) such as tobacco, alcohol, gambling, ultra-processed food and beverage producers are known to influence policy-making to advance their interests, often to the detriment of public health goals. This study mapped the complex system underpinning UCI's influence on public health policy formulation in the UK and identified potential interventions to shift the system towards being able to better attain public health goals. We conducted a participatory systems mapping workshop with ten experts to build a causal loop diagram (CLD) and identify potential interventions to address UCI's influence on public health policy development. The resulting CLD depicts a highly interconnected and reinforcing system driving UCI's involvement in public health policy formulation across five thematic areas. Among the most connected elements were the 'dominance of market mechanisms', 'perception of partnership as good governance principle', 'industry involvement lending perceived legitimacy to the policy formulation process', 'industry is seen as part of the solution' and 'industry ties to policy-makers'. Participants identified a total of 22 interventions within this system. Analysis of the CLD and interventions identified the potential for two key paradigmatic changes in this complex system: de-normalizing the perception of unhealthy commodity industry actors as legitimate stakeholders in policy formulation; and prioritizing public health and wellbeing objectives over profit and economic gain. In order to shift the system towards better attaining public health goals, interventions should reinforce each other and be supportive of these two key paradigmatic shifts.

Keywords: commercial determinants of health, corporate political activity, health policy, non-communicable diseases, unhealthy commodity industries, multi-stakeholderism

Contribution to Health Promotion

- Unhealthy commodity industries (UCIs) are known to influence public health policy-making with detrimental results for public health. There is a need to understand the complex system that enables this influence and its impact.
- Using a participatory systems mapping approach, this study highlights the complex system that underpins UCI involvement through numerous highly interconnected pathways, covering practices, structures and norms.
- To drive change within this complex system, it is essential for action to support two key shifts: de-normalizing the perception of unhealthy commodity industry actors as legitimate stakeholders in policy formulation; and prioritizing public health and wellbeing objectives over privatized profit.

BACKGROUND

The commercial determinants of health (CDoH), defined in a recent Lancet series as 'the systems, practices and pathways through which commercial actors drive health and equity' (Gilmore *et al.*, 2023), reflect the now overwhelming evidence that some commercial actors have a significant negative impact on human and planetary health (Freudenberg, 2012; Moodie *et al.*, 2013; Baum *et al.*, 2016; Gilmore *et al.*, 2023). Beyond the production, marketing and sale of unhealthy commodities, corporations actively work to shape the policy context in favour of the ways in which they conduct their business (Ulucanlar *et al.*, 2016; Gilmore *et al.*, 2023). Unhealthy commodity industries (UCIs), referring here to tobacco, alcohol, food and beverage and gambling industries, have been known to attempt to influence the policy process in order to set the agenda, shift problem framing, and push for more industry-favourable solutions (McCambridge *et al.*, 2014; Campbell *et al.*, 2020; Suzuki

et al., 2022; Ulucanlar *et al.*, 2023). This has subsequently led to the dilution, delay or abandonment of effective population-level policies to address non-communicable diseases (NCDs), which often remain focused on individual responsibility (Williams and Fullagar, 2019). Indeed, recent evidence shows that the implementation of policies seeking to address the harms associated with UCIs has moved backwards (Allen *et al.*, 2023), with corporate influence on public health policy reported as a key barrier to progress (Tangcharoensathien, 2019; Ralston, 2021).

The variety of activities used by UCIs to influence the policy process has been described in a recent taxonomy (Ulucanlar *et al.*, 2023) and included practices such as lobbying or funding research as well as framing activities that portray the industry as a 'good actor' and as 'part of the solution' (Campbell *et al.*, 2020; Lacy-Nichols and Williams, 2021; Legg *et al.*, 2021). In the UK, the government has repeatedly adopted partnership approaches to address NCDs, including with the alcohol, gambling and food industry, even though these have been found to be ineffective (Petticrew *et al.*, 2018; Hawkins and McCambridge, 2019; Laverty *et al.*, 2019; UNDESA and The Partnering Initiative, 2020; Seferidi *et al.*, 2021; van Schalkwyk *et al.*, 2022). England's 2022 Government food strategy champions a collaborative approach with 'government and industry working in partnership on a shared endeavour to promote healthier diets' (DEFRA, 2022). Similarly, in 2023 the Scottish government entered into a collaboration with the Scotch Whisky Association for an awareness campaign, where the Scottish First Minister was quoted as saying that 'this is just one of the key areas of partnership that the Scottish Government and whisky industry can work together on' (Scotch Whisky Association, 2023). Partnerships between government bodies and industry or industry-funded organizations in the UK, as elsewhere, have been widely criticized as being more beneficial for corporations than for public health (Petticrew *et al.*, 2018; Ralston, 2021).

Given the evidence indicating the harmful impact of UCI involvement in policy formulation processes (Carriedo *et al.*, 2020; Hawkins *et al.*, 2021; Lelieveldt, 2023), there is a strong case to be made for preventing, addressing and managing such involvement. To be able to effectively do so, we need to understand the ways in which the wider complex system of norms, structures and processes within which policy-making is embedded enables this involvement (Lencucha and Thow, 2019). Industry influence on policy is fundamentally enabled within a system of norms, structures and processes that rely on collaboration and often consider commercial actors key 'stakeholders' whose interests align with government (Madureira Lima and Galea, 2019; Lencucha, 2022). Complex systems approaches have been highlighted as particularly useful in recognizing the complex, non-linear and interactive ways in which various parts of a system jointly shape its outcome and there is significant scope for research using complex systems approaches to contribute to our understanding of the CDoH (Rutter *et al.*, 2017; Knai *et al.*, 2021).

This article uses a participatory systems mapping approach to map the complex system underpinning UCI involvement in public health policy formulation in the UK and explore potential leverage points within this system where interventions might drive change to improve public health policy formulation processes.

METHODS

Part 1—Participatory systems mapping workshop

The current study included two participatory systems mapping (PSM) workshops, the first of which was used to build a systems map in the form of a causal loop diagram (CLD) (Barbrook-Johnson and Penn, 2022b, 2022c). The second workshop used this systems map as a starting point for participants to identify potential leverage points where action might drive change in this system. Both workshops were conducted online and were video-recorded with participants' permission and subsequently transcribed by the lead author.

Using a PSM approach meant that the workshops were guided by a structured, iterative process of building and analysing causal models of a system, involving a group of participants who each use their expertise to collectively draw out a complex system (Barbrook-Johnson and Penn, 2022c). We selected it because of the emphasis it places on the involvement of participants throughout the systems mapping process: from problem definition through to action (Vennix *et al.*, 1996; Hovmand, 2014; Barbrook-Johnson and Penn, 2022c). Adapting recent guidelines by Barbrook-Johnson and Penn (2022c), we created a CLD where a system is represented by elements (i.e. variables within the system), the causal connections between these elements and feedback loops that indicate reinforcing or balancing interactions between elements (Barbrook-Johnson and Penn, 2022c). Connections between elements are either negative (–) or positive (+), indicating if, when one element increases, the other either decreases (–) or increases (+) in response.

Ten participants were invited to participate in this study. They were identified through their work and the networks of the research team and selected purposively based on their expertise in public health policy formulation in the UK at the national or subnational level. Most participants' experiences related to the commercial practices of the food and alcohol industries, as well as the wider policy-making system. Four participants worked in government, three in non-governmental organizations and three in academia. Participants had different levels of experience working in their respective sectors, ranging from a few years to more than 10 years of work experience in various roles within the sector. After careful consideration among the research team, the decision was made from the outset not to include industry representatives in the systems mapping workshops. Including industry was considered to be inappropriate for the methods we used due to the need for trust and transparency between participants. To enable a fully engaging participatory systems mapping workshop, we required all participants to be open and transparent about their experiences with industry influence on policy-making, which may be inhibited if industry representatives were in the room during the workshops. All ten participants took part in one online PSM workshop, carried out in February 2023. Prior to participation, all participants were sent an information sheet and signed an informed consent form, where they were asked to declare any conflicts of interest (COI). None of the participants declared any COIs. Ethical approval for this study was granted by the Research Ethics Approval Committee for Health (REACH) at the University of Bath (EP22/020).

The lead author facilitated the workshop, which started with an introduction to systems mapping and the involvement of UCIs in public health policy formulation as the central element in the CLD. Participants were given the opportunity to

discuss or ask questions. The scope and boundaries of the CLD were similarly discussed with participants. Participants were then asked to individually write down elements that, based on their experience, influenced or were influenced by the central element. While the mapping workshop was focused on the UK, where all participants lived and worked, they could also bring in broader elements that they saw as contributing to this system. One by one, participants were asked to share their elements, which were mapped in real-time by one member of the research team (A.B.) using Kumu software (Kumu, 2023), which is a software for organizing complex data into visual maps that is particularly useful for the creation of systems maps. After participants suggested an element, the facilitator asked follow-up questions to establish where it should be placed in relation to other elements already on the map and to understand how they perceived that these elements influenced one another.

Throughout the process, participants were asked to pause and reflect on the map as a whole and to highlight where they felt that elements or connections were missing, could be combined or should be removed. During the workshop, participants went through multiple cycles of adding, checking and editing the map. We did not weigh support or agreement on specific elements but did leave space for participants to indicate either during or after the workshop whether they disagreed with any elements. Any disagreements that arose during the workshop were discussed until agreement was achieved. When participants indicated any disagreement after the workshop, as was the case with some terminology used to describe an element in the map, this was brought in for discussion at the second workshop by the research team and discussed until an agreement was reached there. After the first workshop, four members of the research team (A.v.d.A., A.B., A.F. and H.R.) reviewed the map to ensure that it captured the workshop discussions. We then followed up with participants via email and asked them to review the map and verify that it accurately captured the discussions and their contributions, which led to some minor adjustments in terminology and additional connections between some elements which were subsequently changed by the research team and again returned to participants until no further changes were requested.

Part II—Leverage point workshop

The second workshop was conducted in March 2023, 3 weeks after the first workshop. This workshop focused on identifying leverage points as an initial exploration of how interventions might shift a complex system. We use the concept of leverage points—places to intervene in the system—as first described by Meadows in the 1990s (Meadows, 1999). Leverage points present places in a complex system where action may lead to shifts in this system to a smaller or larger extent, based on the level of the system at which it is acted (Meadows, 1999). The scope of leverage points at different system levels can range from shifting parameters within the system at the lowest level to shifting the deepest-held beliefs that govern a system at the highest level (Meadows, 1999). In the current study, we use the Intervention Level Framework (ILF) to structure and analyse the leverage points that participants identified. The ILF was selected for its accessibility and comprehensiveness as it integrates the complexity of Meadows' 12 leverage points into five more accessible 'levels' while maintaining sufficient complexity within those levels that the key distinctions between levels, such as the paradigmatic and goal-level interventions, are able to be effectively communicated. The ILF was initially developed to critically examine the suggested actions to drive a more healthy, green and affordable food system (Malhi *et al*., 2009), and consolidates Meadows' 12 leverage points into the following five levels: (i) paradigm, (ii) goals, (iii) system structure, (iv) feedback and delays and (v) structural elements (see Table 1) (Malhi *et al*., 2009; Finegood, 2011; Johnston *et al*., 2014). The ILF facilitates the analysis of specific interventions according to where in a complex system they operate, how they interact with other aspects of this system and where points of conflict or convergence might occur (Johnston *et al*., 2014). We used this framework to analyse the exploratory leverage points that participants identified, in order to create insight into how action at different levels of the system might interact and be supportive of wider systems change.

The second workshop was again facilitated by the lead author. Due to conflicting schedules and the high workload of participants, only six of the ten participants were able to take part. A further two participants sent their proposals for leverage points via email. At the start of this workshop, participants were shown the systems map and given the opportunity to provide further feedback. Participants were then guided through a number of individual and group exercises, using Miro software as a digital whiteboard (Miro, 2022). Participants were first asked to individually identify leverage points and place these within the systems map. The facilitator copied these leverage points onto a separate whiteboard so the leverage points could be seen side-by-side. Participants were then asked to reflect on the leverage points and to indicate which leverage points they perceived as most relevant to the current system, followed by a group discussion on the positioning of all leverage points in the system map. Following the workshop, all 10 participants who joined the initial workshop were sent the list of identified leverage points and requested that they provide feedback and add leverage points to this initial list. Nine out of these 10 participants responded to this request to suggest changes or provide comments, which were then integrated into the list.

Table 1: Levels of the intervention level framework (adapted from Johnston *et al.*, 2014)

ILF level	Description and examples
(1) **Paradigm**	A system's fundamental values and its, often unstated, deepest-held beliefs *(e.g. values, norms and beliefs)*
(2) **Goals**	The system's goals, what the system is trying to achieve *(e.g. implicit or explicit goals and targets)*
(3) **System structure**	All elements that make up the system as a whole as well as their interconnections *(e.g. processes in the system, organizational structures between subsections of the system)*
(4) **Feedback and delays**	Feed information about the outcome of a specific action back to the source of the action, allowing the system to regulate itself *(e.g. monitoring and information flow between different elements)*
(5) **Structural elements**	Specific subsystems, actors and physical elements of the system *(e.g. financial or physical resources, training and marketing campaigns)*

Analysis

We conducted a combination of deductive and inductive qualitative content analysis of the workshop transcripts, systems map and leverage points to develop themes in the systems map (Schreier, 2012). Our analytical approach was grounded in constructivism, approaching the system underpinning UCI's influence on policy formulation as being constructed, interpreted and re-interpreted in a social system where ideas, norms and discourse wield significant power (Finnemore and Sikkink, 2001). In the context of this study, this meant not only that discourse was considered as a part of the system in the same way physical and social structures were (leading, for example, to the development of 'narrative' as a separate theme in this study) but also that the way participants spoke about various elements of the system was an integral part of the analysis. To inform the deductive aspect of this analysis, we used existing theories on commercial influence on policy as an interpretative lens (particularly drawing on Madureira Lima and Galea, 2019; Wood *et al.*, 2021; Ulucanlar *et al.*, 2023). We used this literature to explore how the multiple pathways of commercial influence are communicated in the systems map. Within this research, we acknowledge that our analysis is necessarily informed by our own understanding of the policy formulation process and the literature on commercial influence on policy formulation. Rather than attempting to remove all researcher bias, we acknowledged and included our subjectivity as part of the analysis while also continuously involving members of the research team and study participants in discussions around the interpretation of the findings.

For the political economy theme in the systems map, we follow Reich's (2019) definition of 'political economy' as 'how the allocation of political resources and economic resources affect who gets what, when, and how' (Reich, 2019, p. 251). We used the integrated causal loop detection function in Kumu as a starting point to detect causal loops in the system map (Kumu, 2023). In our analysis of the leverage points, we used the ILF (Table 1) as a conceptual framework to guide our thinking on the placement, reach and interactions of various leverage points. Initial coding of the CLD and leverage points was conducted by the lead author, who iteratively developed themes. These were discussed with co-authors and presented back to participants via email following the second workshop, to ensure that the themes identified accurately reflected the workshop discussion. Participants commented mostly on the terminology used and suggested that some leverage points might be grouped together. The researchers followed this advice and presented the second version of the leverage points back to participants, again via email, to which all participants agreed with no further amendments. By using the ILF as a conceptual framework, the authors were able to not only map the leverage points onto the different levels of the ILF but also collate different leverage points and identify the larger goal or paradigm shift these leverage points either explicitly or implicitly aimed to realize.

RESULTS

Figure 1 shows the full CLD, colour-coded into the five themes that were developed through the analysis: industry, narrative,

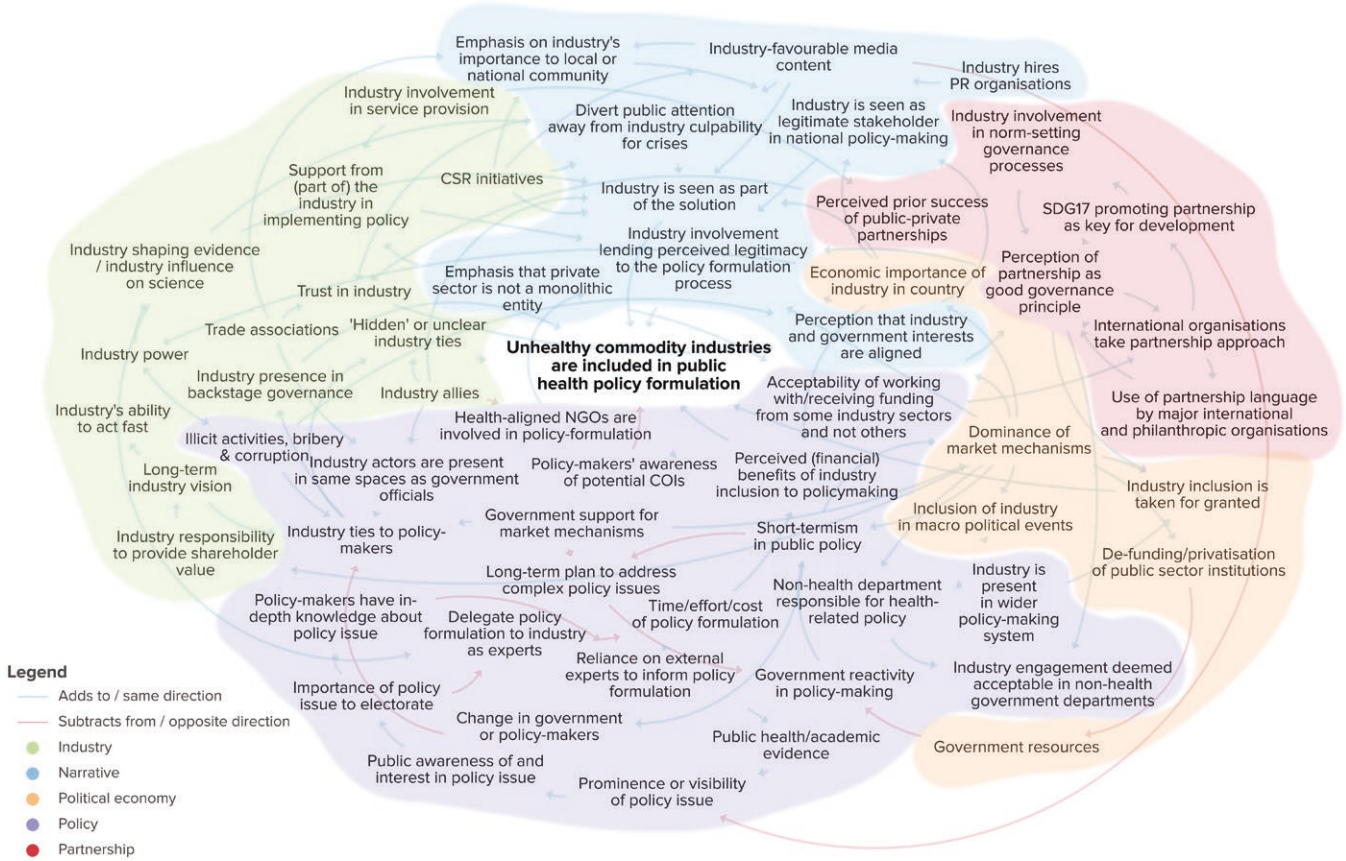

Fig. 1: Overall systems map of the drivers of UCI influence on public health policy formulation in the UK.

political economy, policy and partnership. The most connected elements in the system map have been made in bold italics. Supplementary File S1 provides an overview of these themes and the elements within each, including a description of each element. Analysis of the system map revealed a large number of connections between elements that act in reinforcing causal loops, meaning that they further embed the role of these elements in the overall system map. The links between these elements in the causal loops indicate how practices, structures and norms throughout the system interact and reinforce one another.

Themes within the CLD

Industry activity and characteristics

Elements situated in the industry theme relate to industry interactions with policy-makers, including *'industry presence in backstage governance'*, or *'hidden or unclear industry ties'*; industry interactions with communities, including *'harm reduction/social responsibility initiatives'* or *'trust in industry'*; and characteristics of industry itself, such as *'industry involvement in trade associations'*, *'industry front groups'* and *'industry responsibility to provide shareholder value'*.

'Industry power' was a central element in this theme, enabling industry influence throughout the system while also being further embedded through industry involvement in policy development. For example, industry power was linked to industry funding of science, which in turn led to industry-favourable research findings, diverted public and political attention away from industry culpability for health problems, and framed industry as part of the solution. Another much-discussed element within this theme was *'industry front groups'*, which refers to the known industry tactic of associating with, funding or founding third-party organizations, often non-governmental organizations (NGOs), to covertly advocate for or represent the industry's interest (STOP, 2023). These front groups were seen to create *'hidden or unclear industry ties'*, to enable *'industry actors [to be] present in same spaces as government officials'* and diminish the involvement of health-aligned NGOs in policy formulation, as industry front groups might either replace health NGOs or create general distrust of NGOs. As one participant remarked, *'they become almost a front then for the industry and they are a very powerful voice. They're perceived by those in the community as a patient's group. That link behind it is not seen'* (NGO).

Narrative

Participants reflected on the fact that corporate influence is not merely conducted through 'action' strategies, but also through framing strategies (i.e. promoting a certain narrative or discourse) (Ulucanlar *et al.*, 2023). The systems map shows how narratives or discourses surrounding industry activities, policy-making and corporate influence on policy-making are both impacted by and have an impact on the practices, structures and norms in the system. Elements covered in this theme include *'Emphasis on industry's importance to local or national community'*, *'industry is seen as part of the solution'* and *'including industry is perceived to lend legitimacy to the policy-formulation process'*. As an example of emphasizing the locality of a product, one participant remarked that *'[in] a political environment such as Scotland where, you know, the government of the SNP [Scottish National Party] have a very strong sense of national identity, being able to place themselves as a Scottish brand is very powerful'* (NGO).

Participants noted that some of the narratives covered in this systems map spring from wider economic or political norms in the UK. For example, the perceived economic importance that an industry has in a country leads to this industry being perceived as part of the solution and a legitimate stakeholder in national policy-making. As one participant noted about their experience of bringing industry into a local policy formulation process, *'[it] really felt like it conferred legitimacy on the event. […] this particular local team didn't tend to talk to industry so much, so it felt genuinely like a kind of mark of how serious this work was and how well it would be received'* (Government). Other narratives that create perceived legitimacy for industry actors were explicitly created by the industry, as participants mentioned that the industry is known to hire public relations organizations to produce industry-favourable media content, diverting public attention away from industry culpability and reducing the prominence of a specific public health policy issue, while reinforcing the idea that industry is part of the solution (Miller *et al.*, 2011; MacKenzie *et al.*, 2018; McCambridge *et al.*, 2021). Fundamentally, the industry is included in the policy-making process further perpetuates this narrative of the industry as 'part of the solution', thereby further contributing to the perceived legitimacy of the industry's position as a key stakeholder within the policy system (Lacy-Nichols and Williams, 2021).

Political economy

Elements that fall under this theme include 'de-funding/privatization of public sector institutions', 'dominance of market mechanisms', 'government resources' and 'perception that industry and government interests are aligned'.

The *'dominance of market mechanisms'* is the most connected element in the entire map, as participants perceived this to be a core driver of many of the outcomes within the map, including *'industry inclusion [being] taken for granted'* and the *'inclusion of industry in macro political events'* in the UK. For the latter, participants gave as an example that industry actors may share the stage with politicians to discuss political events, which participants saw as legitimizing industry involvement within government and facilitating their influence on policy-making processes. One participant explained this by saying *'I mean for instance, the Brexit conference that was hosted by [political actor], the leader of [company] and others were there. So there is that kind of overt attempt by government to bring people in. Justifiably in some issues about trade and things, but that then leads to these companies, these individuals being in the room for further discussions, and they become part of that kind of political discourse'* (NGO).

Policy

As part of the 'policy' theme, participants discussed elements related to the policy-making process itself, including a *'reliance on external experts to inform policy formulation'*, driven by a lack of *'government resources'*, *'public awareness of and interest in a policy issue'* and the *'time, effort and cost of policy formulation'*. Participants noted *'perceived (financial) benefits of industry inclusion in policy-making'*, for example, by providing expertise ostensibly but by no means necessarily reducing the workload of civil servants, as a driver of UCIs involvement in policy formulation processes. This was considered particularly relevant in a context of constrained

government resources combined with high cost, effort and time commitment related to policy formulation. As one participant noted, *'just the resourcing from the policy point of view. The less resources you have, in particular, it's harder to make the argument to keep industry out when they're making a really good offer in an environment where it's very hard to justify spending money on something someone's trying to give you for free'* (Government). Participants also discussed governance practices surrounding policy-making, particularly around COIs, noting a strong inverse relation between *'policy-makers' awareness of potential COIs'* and the inclusion of UCIs in policy formulation at the centre of the map.

Partnership

Participants considered the *'perception of partnership as a good governance principle'* as a key enabler of UCI involvement in policy formulation. For example, one participant recalled that in recent local work *'we invited industry and there were two reasons. And one of them I think is very simple, which was that it was in the guidance. So I think sometimes, you know, especially when one is operating on the local level, it's just this is what seems to be the thing to do. And that perception that someone else has thought about it, and so you don't have to'* (Government). This, in turn, was linked to the following, which were also interconnected: '*industry involvement in norm-setting around governance processes*', the '*use of partnership language by major international and philanthropic organizations*', the *'acceptability of working with/receiving funding from some industry sectors and not others*', the '*perception that industry and government interests are aligned*' and the *'perceived prior success of public–private partnerships'*. For the latter, participants emphasized that the perceived success of these partnerships may be partly based on industry-funded science, questioning the validity of these evaluations and the true effectiveness of these partnerships.

Leverage points

Participants identified many potential leverage points within this complex system, categorized according to the ILF (see Table 2). Most leverage points that participants identified were situated at the systems structure level, where they change the structure of the system, either within or across subsystems, or incorporate novel elements into the system (Johnston *et al.*, 2014). Participants also identified a number of key goals for the system to move towards, which may contribute to shifting the aims and paradigm of the entire system. These included:

(i) *Adopt a health in all policies approach*;
(ii) *Set long-term public health goals separately from the political cycle to ensure that long-term health gains through upstream action remains a priority*;
(iii) *Establish and adhere to strong governance principles regarding engaging with private sector actors, revolving door employment, conflicts of interest and transparency and disclosure rules, amongst others, to aid policy-makers in assessing the risks and benefits of industry engagement*, and;
(iv) *Move away from narratives regarding multi-stakeholderism as a 'good governance' principle*.

What these goals have in common is to enable a policy-making system that prioritizes public health and adheres to strong governance principles enabling the creation of long-term public health gains. Notably, these goals are not focused on stopping corporate practices but rather on building policy-making structures and norms that prioritize public health over corporate interests. This indicates that rather than trying to manage or address corporate political activity (CPA), it is crucial to create a system that de-normalizes such CPA and has accountability structures in place to address this, and that fundamentally enables governments to fulfil their role in protecting, promoting and assuring the health of their citizens (Friel *et al.*, 2023).

A key part of this de-normalization of UCI involvement in public health policy formulation is to move away from a prioritization of economic profit over population health and wellbeing and, as part of that, recognize when commercial and public interests are not aligned (Lencucha, 2022). These fundamental system shifts are reflected in the paradigm shifts participants identified, which are first to de-normalize the perception of unhealthy commodity industry actors as legitimate stakeholders in policy formulation. The second paradigm shift is prioritizing public health and wellbeing objectives over profit and economic gain (Table 2). Crucially, participants emphasized the importance of approaching these leverage points as aligned and reinforcing across interventions, levels and parts of the system. Rather than focusing on one specific intervention in the context of the wider complex system, the successful implementation of these, and other, leverage points may jointly drive systemic change in ways that no single intervention would be able to achieve alone.

DISCUSSION

Participants identified a wide range of highly interconnected elements making up the complex system underpinning UCIs' involvement in public health policy formulation processes in the UK, embedded within wider existing social, economic and political practices, structures and norms. The reinforcing causal loops within this system indicate how practices, structures and norms reinforce one another to further embed the current system. Crucially, the elements throughout the system map interact and reinforce one another in ways so that the sum of their interactions is greater than its constituent parts (Rutter *et al.*, 2017). Analysis of the causal loops within the complex system indicates how elements that may be categorized as practices, structures or norms interact with and reinforce one another to increasingly embed the existing pathways in the system. These findings provide further evidence to a growing body of research highlighting the importance of understanding the wider political economy, including governance structures and institutions, as integral to commercial influence on health (Friel *et al.*, 2023; Gilmore *et al.*, 2023; Ralston *et al.*, 2023). Our findings support Lencucha's (2022) argument that industry influence is not only a result of corporate power *over* the policy process but rather 'power *within* and *through* a system that is oriented towards profit and economic growth' (Lencucha, 2022, p. 2736). The complex systems map and causal loops identified in this study illustrate how only considering commercial actor practices does not sufficiently capture how wider structures and norms—reinforcing and increasingly embedded—facilitate these commercial practices.

The importance of this wider political economy lens is evident in the systems map, as the most connected element in the map was the 'dominance of market mechanisms'. This

Table 2: Proposed leverage points to address UCI influence on public health policy formulation, categorized according to the intervention level framework (ILF)

Level	Proposed intervention
Paradigm	1. De-normalize the inclusion of unhealthy commodity industries in government processes and political events
	2. Move away from a prioritization of economic profit over population health and wellbeing
Goals	3. Implement and adhere to strong governance principles throughout government to guide policy-maker engagement with industry
	4. Adopt a Health in All Policies (HiAP) approach throughout government
	5. Develop clear and measurable long-term goals for public health
	6. Avoid narratives relating to partnership as a principle of good governance in normative documents
	7. Ensure the presence of public health advocates in all policy processes to balance other involved stakeholders
System structure	8. Engage from a cross-commodity starting point as public health advocates
	9. Require independent external evaluations of public–private partnerships to avoid and expose biased evaluations.
	10. Increase co-production of public health research with relevant civil society and public health actors
	11. Require transparency of industry funding to any groups or organizations
	12. Require research institutions to develop policies for mitigating or eliminating financial conflicts of interest
	13. Routinely perform assessment of bias related to funding source as part of evidence evaluation and synthesis
	14. Ensure that research on unhealthy commodities considers wider policy implications of the research and provides recommendations for policy and action
Feedback and delays	15. Engage with industry shareholders on public health topics to advocate for prioritization of health/social gains over profit
	16. Enhance policy-maker knowledge on unhealthy commodities and their public health impact
	17. Generate independent evidence on the commercial determinants of health
	18. Run campaigns to increase public interest and knowledge on unhealthy commodities and their public health impact
Structural elements	19. Develop coherent narratives and media messaging across public health advocates and academics surrounding unhealthy commodity industries
	20. Clear guidance on partnership with non-state actors
	21. Avoid tobacco industry exceptionalism
	22. Regulate unhealthy commodity industry products

indicates that, despite increasing recognition that unbounded economic growth is neither feasible nor desirable for human, societal and environmental wellbeing (Jackson, 2017), the political and economic context in the UK has continued to prioritize profit over human and planetary wellbeing in many sectors, including public health (Buse *et al*., 2017; Buse and Bayliss, 2022). Indeed, the supposed economic and employment benefits that a corporation provides have been used by corporate actors as a successful argument against stricter regulation of their activities (Ulucanlar *et al*., 2023), as well as a justification for their involvement in the policy-making process (Lacy-Nichols and Williams, 2021). However, these arguments for economic benefit are in many instances more true for small and medium enterprises, which disproportionally contribute to inclusive economic growth and employment when compared to large transnational corporations (OECD, 2017; Gilmore *et al*., 2023), and often fail to incorporate the true environmental, social and health costs to society caused by industries that drive significant health and environmental harm while privatizing profits (Baker *et al*., 2020; Patel, 2021). These various direct and indirect links between the 'dominance of market mechanisms' and UCI influence in public health policy formulation processes highlight the importance of the first key shift identified by participants: to move away from a prioritization of profit and economic gain over public health and wellbeing. In a recent Lancet series on the CDOH, Friel *et al*. (2023) describe how such a paradigm shift may be supported by progressive business models that include health, equity and sustainability as embedded goals, macroeconomic policies that ensure fair social foundations and economic environments within environmental boundaries, and public policy processes free from commercial interference (Friel *et al*., 2023). Moving away from solely growth-focused economies towards purpose-driven economic strategies, for example, those building on doughnut economic or wellbeing economy approaches as guiding frameworks for policy development, may usefully support such a shift in prioritization and drive meaningful policy impact on a society's health and wellbeing (Raworth, 2017; Fioramonti *et al*., 2022; Wahlund and Hansen, 2022).

Another recurring theme throughout the systems map refers to a 'perception that industry and government interests are aligned' and that 'industry is seen as part of the solution'. While this study focuses on UCIs in general, there are significant differences between industries in the extent to which they are perceived as part of the solution. While the tobacco industry's interests are generally understood to be completely misaligned with public health interests (Collin *et al*., 2017), the food industry is more likely to be seen as a legitimate partner whose interests are at least to some extent aligned with the interests of government (Lencucha and Thow, 2019; Lacy-Nichols and Williams, 2021; Lencucha, 2022). This notion of aligned interest has been problematized by those who point out that the interest of an industry whose profit is derived from health-harming products is necessarily in conflict with that of the government, whose responsibility is to its citizens and their right to health (McKeon, 2017). Research on the industry 'playbook' of how they attempt to influence policy-making repeatedly found numerous similarities in strategies between different industry sectors (Lacy-Nichols

et al., 2022; Ulucanlar *et al.*, 2023). While the participants included in this study mostly had experiences relating to the alcohol and food industries, and there may be different pathways open to other industry sectors, the broader system that enables industry influence is likely to be relevant for other industry sectors as well. Crucially, the diversity both of commercial actors and the pathways through which they impact public health mean that policy processes across sectors will need to be conscious of potential harms due to industry interference and how broader structures and norms may enable or hinder policy coherence, beyond public health (Friel *et al.*, 2023). Moreover, the detrimental impact of including UCIs as partners in policy formulation, on both the quality of the policy-making process and the effectiveness of its outcomes, has been repeatedly shown in national and international contexts and across industry sectors (Hatchard *et al.*, 2016; Mialon *et al.*, 2016; Jastram and Klingenberg, 2018; Rosewarne *et al.*, 2020; van Schalkwyk *et al.*, 2022; Lelieveldt, 2023). Evidence suggests that the voluntary inclusion of industry in policy formulation processes through a partnership approach contributes to the institutionalization of a policy regime which is highly favourable for the private sector and allows them to engage with policy-makers and influence the policy agenda as embedded stakeholders (Hawkins and McCambridge, 2019). As such, the de-normalization of UCIs as policy stakeholders, another key paradigmatic shift identified in this study, may be key to addressing UCI's influence on public health policy formulation.

Recognizing how the complex interconnections between practices, structures and norms facilitate commercial influence on public health policy formulation has implications for the ways in which such influence might effectively be prevented, addressed or mitigated (Lencucha, 2022; Friel *et al.*, 2023). Participants identified a range of leverage points, in line with previously identified interventions to address corporate influence on public health policy (Mialon *et al.*, 2020; Lacy-Nichols *et al.*, 2022; Friel *et al.*, 2023; Bertscher *et al.*, 2024), that may be useful starting points for further understanding of how different interventions might shift this complex system. For example, strong governance principles, including accountability and monitoring mechanisms and conflict of interest guidelines (intervention no. 3), have been identified as a key facilitator to enabling effective action on the CDoH and related public health issues (Loffreda *et al.*, 2023). Similarly, research has highlighted that research and advocacy need to move beyond single commodities (intervention no. 8) as different industries use similar practices (McCambridge and Morris, 2019). Evidence such as the recent CPA taxonomy by Ulucanlar *et al.* (2023) and the 'Science for Profit model' by Legg *et al.* (2021) highlight the commonalities between industry strategies, as well as how broader systemic structures and norms enable these and will also need to be addressed in order to fully be able to prevent harmful strategies from taking place (Legg *et al.*, 2021; Ulucanlar *et al.*, 2023). Recognizing the similar strategies adopted by different industry sectors, Lacy-Nichols *et al.* (2022) have developed a 'public health playbook', proposing eight initial strategies to challenge corporate activities, which include developing and implementing rigorous conflict of interest safeguards, monitoring and exposing corporate activities and increasing public sector resources, among others (Lacy-Nichols *et al.*, 2022). These strategies are in line with the findings from this study, which further support their potential ability to shift the system enabling UCI's influence on public health policy formulation. Crucially, these interventions would need to take place at different levels of the complex system and reinforce one another. There is no single solution that will fully address UCI's influence on public health policy formulation, and doing so will require both action on specific industry actors or strategies as well as broader changes to the structures and norms shaping policy systems (Friel *et al.*, 2023).

The findings from this study may provide a useful complex systems perspective on the context within which such interventions could be implemented and indicate how different interventions might interact at different levels of this complex system. For example, developing strong independent evidence on the complex system surrounding the CDoH (intervention no. 17) requires that research institutions and other organizations are not funded by commercial actors (intervention nos. 12 and 13), as evidence indicates how industry funding of science influences research questions, methods and conclusions (Fabbri *et al.*, 2018; Legg *et al.*, 2021). The same is true for evaluations of existing public–private partnerships (intervention no. 9), as evidence indicates that favourable evaluations of public–private partnerships were more likely to be not independent as well as of poorer quality (Parker *et al.*, 2019). This may potentially lead to a skewed perception of the effectiveness of such partnerships and again emphasizes the importance of transparency of funding in science (intervention no. 12) and of routinely assessing potential biases related to funding sources as part of evidence evaluation and synthesis (intervention no. 13). Similarly, the adoption of a HiAP approach throughout government (intervention no. 4) has been identified as a key enabler of moving away from a predominantly profit-oriented society (intervention no. 2) (Porcelli *et al.*, 2023), and may be facilitated by using media messaging (intervention nos. 18 and 19) to enhance policy-maker knowledge on and interest in UCIs' impact on health (intervention no. 16). Although interventions at the level of the system paradigm have the potential to create the most impact, they are also deemed to be the most challenging to implement (Carey and Crammond, 2015; Durham *et al.*, 2018). Indeed, while many of the interventions—particularly those at higher system levels—have not yet been implemented or evaluated (Mialon *et al.*, 2020), some evaluations of regulation efforts in particular (intervention no. 22) have indicated the cost-effectiveness of these more structural interventions (Kaewpramkusol *et al.*, 2019; Nystrand *et al.*, 2021). Acting at lower levels of the system ought therefore not to be discounted. Rather, our findings suggest that changing the complex system underpinning and enabling UCI involvement in public health policy formulation in the UK will require interventions to occur across system levels, supported by and in support of a shift in the system's overarching paradigm.

One potential limitation of this study was the limited number of participants and the decision to exclude industry representatives from our participant sample. While we believe this is appropriate given the need for trust and open discussion as integral to the methods used in this study, an important implication of this decision is that the analysis presented here is limited to the experiences of the participants who attended. Nevertheless, recognizing the potential limitations arising from this decision, other studies in the larger program of research of which the current study is a part do explore industry perspectives on aspects of this complex system through semi-structured interviews. A second

limitation relates to our focus on UCIs in general rather than focusing on one specific industry. While we have made a conscious decision to do this because of the significant overlap in practices between industries (Hawkins *et al*., 2018; McCambridge *et al*., 2018; Knai *et al*., 2021), and to reflect how the wider complex system of structures, discourses and institutions enables commercial actor practices (Lencucha, 2022; Ralston *et al*., 2023), there may be differences between industries that are not captured in this study. As most of the participants in the current study had experiences relating to the alcohol and food industry, it is a worthwhile avenue for future research to identify potential differences and similarities in the systems enabling industry influence in other sectors, including the tobacco, gambling, motorized vehicles and pharmaceutical industries, among others. Third, while the number of participants included in the participatory systems mapping workshops was in line with recommendations (Barbrook-Johnson and Penn, 2022a), the sample size remains a limitation in this study. It might have been particularly beneficial to include more participants for the identification of leverage points. The current sample was sufficient for this study's purpose, but it would be a useful area for future research to replicate this study in different contexts and at a larger scale, to support these findings. Both workshops in the current study were conducted online. The benefits of conducting a PSM workshop online include that it allowed us to invite a wider range of participants from throughout the UK, whose busy schedules may not have allowed them to travel to a central location to participate in an in-person workshop. Moreover, conducting this workshop online gave participants the option to keep their cameras off, which some participants did and which may have made them feel more comfortable contributing to the discussion. At the same time, conducting a PSM workshop online does have some limitations, one of which being that there is less flexibility in accommodating various types of participant engagement—for example through small-group discussions or by adding elements onto the map through sticky notes—as large-group discussions are not the preferred mode of engagement for all participants. We attempted to mitigate this drawback by giving participants the option to put their suggestions in the chat and by following up with participants via email after the workshop.

CONCLUSION

This study has provided insight into the complex system underpinning unhealthy commodity industries' involvement in public health policy formulation, highlighting the interconnectedness of this system across practices, structures and norms. The dominance of market mechanisms was identified as a core element enabling many of the other aspects of the system, presenting a fundamental challenge to addressing UCI's influence on public health policy formulation. Additionally, participants also highlighted industry being perceived as part of the solution as a central driver in the current system. This was perceived by participants to be in part the result of increasingly formalized collaborative processes, aligned with a prevailing narrative of multistakeholder governance as 'good governance'. To shift this complex system, participants identified potential interventions at multiple levels and places within the system. Through their interactions with each other and the wider system, these leverage points contributed to two important paradigmatic shifts: de-normalizing the perception of unhealthy commodity industry actors as legitimate stakeholders in policy formulation and prioritizing public health and wellbeing objectives over profit and economic gain.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Health Promotion International* online.

AUTHOR CONTRIBUTIONS

AG obtained the funding for the work; A.v.d.A., A.F., A.G. and H.R. contributed to the conception and design of the work; A.v.d.A. and A.B. contributed to data collection, A.v.d.A., A.F., C.K., N.C. and H.R. contributed to data analysis; A.v.d.A. wrote the first draft of the manuscript and all authors have edited drafts of the work.

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CONFLICT OF INTEREST

None declared.

ETHICAL APPROVAL

Ethical approval (EP22/020) was granted by the Research Ethics Approval Committee for Health (REACH) at the University of Bath.

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