IN SUPPORT OF THE NATIONAL STRATEGY TO REDUCE GAMBLING HARMS

Research Expertise and the Framework of Harms:
Social Network Analysis, Phase Two

AUGUST 2023
This report represents the second phase of a social network analysis of UK researchers who have authored gambling harm studies. In Phase 1, we focused solely on researchers with an institutional affiliation in the UK and their connections to other UK-based researchers. In Phase 2, we extend the analysis to include their coauthors affiliated with research institutions in other countries. The goal of examining the international connections of UK-based researchers is to better understand the strength of existing links among researchers nationally and internationally with expertise in specific areas of harm. The analysis is based on the Framework of Harms (“the Framework”), outlined in Measuring gambling-related harms: A framework for action. To advance the National Strategy to Reduce Gambling Harms effectively, a strong evidence base is required to support each of the three primary factors and eight related subfactors in the Framework.

In this report, we continue to explore the alignment of research with the Framework by taking a closer look at the international coauthors of UK researchers through a social network analysis of coauthors of academic publications that include at least one UK-based researcher from 2008 to 2019. By doing so, we gain a better understanding of the exchange of expertise between UK and international researchers. Citations were limited to peer-reviewed items. A Web of Science search was used to retrieve articles. Of the 1417 records initially identified in the search, the dataset was refined to include only those publications that could be assigned to at least one Framework factor (n = 276). The primary factors and subfactors are Resources (Work and Employment, Money and Debt, Crime); Relationships (Partners, Families, and Friends, Community); and Health (Physical Health, Psychological Distress, Mental Health). NetworkX software was used to create visualisations that reflect degree centrality (number of connections between authors) and researchers’ country to allow each factor and subfactor to be assessed for the number and patterns of coauthor collaborations.

Altogether, there were 681 coauthors in the network, with 287 based in the UK and 394 from other countries. Coauthors with whom UK researchers collaborated were affiliated with institutions in 35 different countries. The following nations were most often represented: US (79), Italy (54), Australia (51), Canada (37), and Spain (31). Average degree (which indicates the level of collaboration among those in the network) varied across networks. The Health factor and its subfactors showed strong levels of international collaboration, whereas other factors such as the Crime subfactor of Resources had only one link to an international coauthor. Other subfactors such as Relationships-Partners, Families, and Friends and Health-Physical Health had a limited number of UK-based researchers with coauthor networks that included several internationally-based researchers. Many of these authors were identified in Phase 1 as multiple factor researchers, (i.e., they worked in more than one factor area of specialisation). These researchers are well positioned to both share and receive information and expertise from coauthors based both within and outside of the UK.

For the more established areas of gambling harms research, particularly those in the Health domain, high levels of existing international collaborations allow coauthors based in the UK to readily capitalise on national and international expertise as well as share their expertise internationally. There is limited research at present for the Relationships domain, but it includes a moderate level of international collaboration that forms a basis for continued flow of expertise. The Resources domain is less well researched overall and has few international collaborations. To support a more comprehensive, nationally and internationally informed evidence base for the Framework, priority harms and funding opportunities will need further consideration.

Abstract

This report represents the second phase of a social network analysis of UK researchers who have authored gambling harm studies. In Phase 1, we focused solely on researchers with an institutional affiliation in the UK and their connections to other UK-based researchers. In Phase 2, we extend the analysis to include their coauthors affiliated with research institutions in other countries. The goal of examining the international connections of UK-based researchers is to better understand the strength of existing links among researchers nationally and internationally with expertise in specific areas of harm. The analysis is based on the Framework of Harms (“the Framework”), outlined in Measuring gambling-related harms: A framework for action. To advance the National Strategy to Reduce Gambling Harms effectively, a strong evidence base is required to support each of the three primary factors and eight related subfactors in the Framework.

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Introduction

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Background to the Report:
Phase 2
Background to the report

Situating gambling harm research networks internationally

The focus on identifying and treating the people at risk of, or experiencing, gambling problems has begun to shift toward preventing and reducing harms from gambling at the population level. This transition extends beyond the medical model of gambling policy to more closely align with a public health policy model for preventing, reducing, and mitigating gambling harms.

The public health model adopts a whole population approach and includes people across the full gambling risk spectrum. The policy goal is healthy communities and resilient and healthy individuals, with a focus on changing the gambling environment. The aim of a public health approach is to reduce or prevent gambling harms by addressing the many contextual factors from a social determinants of health perspective that may contribute to harm.

Guided by the Framework of Harms underlying the National Strategy to Reduce Gambling Harms, the Phase 1 report explored the distribution of gambling harm expertise among researchers based in the UK. We noted dense, extensive coauthor networks for mental health harms, but saw limited collaborations in areas such as harm to the community, and harm to the workplace and employment. We also identified a small group of researchers whose publications bridged multiple harm factors and who often collaborated on research projects. These authors are well positioned to support interdisciplinary collaborations, and to transfer information about novel findings and funding opportunities for gambling harms research.

In Phase 2, we turn our attention to coauthor networks of UK-based researchers that include their international counterparts. International expertise can impart new specialist knowledge of gambling harms, and extend insights into conditions, solutions, and new research techniques to help support the evidence base required for public health policy.
Background to the report

National Strategy to Reduce Gambling Harms

The National Strategy to Reduce Gambling Harms (the "National Strategy"), was released by the Gambling Commission in 2019 to "make better and faster progress to reduce gambling harms". The National Strategy aligns with the public health policy model and addresses gambling harms by implementing three levels of measures: universal (whole population), selective (at-risk groups), and indicated (at-risk individuals).

The National Strategy rests on two pillars: Prevention and Education, and Treatment and Support. The four enablers are regulation and oversight, evaluation, collaboration, and research to inform action.

Underlying the National Strategy is the Framework of Harms (the "Framework"). It both informs understanding of gambling-related harms in Great Britain and provides a preliminary set of harm metrics to monitor stability and changes in levels of gambling-related harms over time. Research expertise is essential to support and refine the gambling harms metrics and to share new insights that could aid in reducing and preventing harms from gambling. This requires an understanding of existing research expertise for each harm area. Having conducted a social network analysis of UK-based researchers whose publications align with the Framework, Greo has extended the network analysis to include international collaborators to gain further insights into areas of research strength and limitations.

Greo is an independent knowledge translation and exchange organisation with experience in generating, synthesising, and mobilising research across the health and wellbeing sectors. As part of its work programme, Greo provides support to the National Strategy, primarily in the areas of research to inform action and evaluation.
The Framework of Harms is presented in Measuring gambling-related harms: A framework for action. Published by the Gambling Commission in 2018, the report provides a working definition of gambling-related harms that is used to inform strategic policy development and practice. The report addresses how to conceptualise and track gambling-related harms and explores the potential to estimate the social costs of gambling harms.

The Framework categorises gambling harms into three primary factors: Resources, Relationships, and Health, with eight associated subfactors. It also suggests indicators, or metrics, that can be regularly monitored to assess the social costs. For the Phase 2 analysis, we focus on the primary factors and subfactors to guide the understanding of gambling-related harms expertise for researchers based in the UK and their international collaborators.

To enhance capacity development that will help to support and advance the National Strategy, it is important to understand how UK-based research expertise aligns with the Framework. Having identified the coauthor networks of UK-based researchers whose research supports the Framework in Phase 1, for Phase 2 we expand the network to include international experts with whom UK-based authors collaborate.

Our aim is to examine the international collaborations of UK researchers with expertise in specific harm Framework factors to identify the strength of existing links in a broader network. To do so, we explore:

• The extent to which each factor and subfactor in the Framework includes international coauthors (over a 12-year period);
• The countries in which gambling harms researchers who collaborate with UK-based researchers are located;
• The level of collaboration between UK-based and international coauthors, and how it differs by Framework factor; and,
• The extent to which researchers based in the UK work primarily with other UK researchers or extend their collaborations internationally.

The Phase 1 report is publicly available. Although it may be helpful, it is not necessary to read the first report in advance to understand the findings of the Phase 2 analysis.
Approach: Social Network Analysis
Social network analysis uses quantitative methods to examine the structure of relationships among people, groups, or organisations. It is commonly used in studies of social capital, and increasingly in health research. Social network analysis provides information about the number of actors in a network, with whom they interact, and how frequently this occurs. But it can also show other things. For example, it can identify central actors, who may be in a position of power or influence within a network, as well as those who operate on the periphery. This information helps to illuminate the extent to which members may have access to resources such as social, informational, and material supports.

A social network perspective allows us to see each person as part of a network and then look for explanations about the structure of the network behaviour, rather than the behaviour of individuals alone. Networks are normally captured in a visualisation, which can reveal patterns of relationships. The patterns can indicate who are the connecters or brokers, who works independently, where research clusters exist and who belongs to them, and who is in a position of influence within the network.

Conducting a social network analysis of researchers who examine gambling-related harms provides an overview of research expertise in relation to the Framework, and each of the factors and subfactors. The visualisations provide evidence of the coverage (or lack of coverage) of research expertise in each. By examining and comparing these visualisations, priorities may emerge for new research directions and capacity development.
Information about how the social network analysis was conducted is presented in the next section. It includes the search strategy and refinement of results, data coding and analysis, and guidance for interpreting network visualisations.

We present visualisations for the Framework overall and each of the factors and subfactors. Highlights are provided for what the statistical results and visualisations represent. Networks of expertise are reviewed from the perspective of the intensity of international collaboration, countries that contribute expertise, and how these networks could support future research. For some subfactors, countries with considerable expertise are suggested, based on the Greo Evidence Centre\(^8\) collection. Although not exhaustive, it uses the Framework of Harms\(^2\) and Conceptual Framework of Harmful Gambling\(^9\) to guide collection development.

Note that the social network analysis does not depict all people active in gambling research in the UK and their international coauthors. Instead, it is limited to researchers whose publications align with Framework factors.
SEARCH STRATEGY

• The search strategy was the same as outlined in Phase 1. To summarise, we searched for research articles on Web of Science, a large academic publication database with multidisciplinary coverage.

• All articles with "gambl**" in the title, abstract, or keywords, and at least one author from the UK were included in the search. Searches for 2008-2018 publications were performed on 25 June 2019, and the search for 2019 publications was performed on 29 June 2020.

INCLUSION/EXCLUSION AND CODING

• Included were peer-reviewed research articles and reviews, editorials, letters, and conference presentations not yet published as full papers. We excluded journal issue introductions, books, book chapters, and book reviews.

• Two coders read the Framework fully to determine the relevance of all materials to gambling harms in the Framework before coding any articles.

• The coders then independently coded 15 randomly selected articles and compared their answers to reach consensus on inclusion/exclusion and factor coding. This process was repeated until >90% agreement was reached (a total of eight times). One coder then coded the remaining articles.

CONSULTATION TO FILL IN MISSING DATA

• Once the 2008-2019 articles were coded, the dataset included 254 articles relevant to the Framework. We emailed the publication list to all UK authors in the dataset and asked them to identify any articles we may have missed.

• Sixteen authors responded to the consultation, adding 22 more articles, resulting in a final dataset of 276 articles.
### Modified PRISMA Flow Diagram for article inclusion

**Approach:** Social Network Analysis

**Modified PRISMA Flow Diagram**

1. **Identification**
   - Records identified through Web of Science database search (n = 1423)
   - Records after duplicates removed (n = 1417)

2. **Screening**
   - Records screened (n = 1417)
   - Articles assessed for eligibility (n = 1323)

3. **Eligibility**
   - Articles included from database search (n = 254)
   - Articles excluded as out of scope (n = 1069)
     - 535: unrelated to gambling
     - 534: related to gambling but not gambling harms

4. **Included**
   - Articles included in final dataset (n = 276)
   - Articles added from author consultation (n = 22)

- Records excluded (n = 94)
  - 66: wrong document type
  - 27: no UK author
  - 1: article not in English
Visualising research collaboration networks

The 276 articles that could be coded to the Framework were collected as plain text files from Web of Science.

Using the metaknowledge software package,\(^\text{11}\) we processed the plain text files to create a list of all authors on these articles. There were 681 authors in total. Of these authors, 287 were affiliated with UK research institutions. In total, researchers based in 35 other countries collaborated with coauthors in the UK.

This metadata allowed us to create a coauthorship network to represent academic collaboration of UK-based gambling harms researchers and their international coauthors. Subnetworks were generated by filtering authors based on their research in different Framework factors.

All networks in this report\(^*\) were visualised using NetworkX,\(^\text{12}\) a software package developed in Python for the study of the dynamics and structures of complex networks. This allows us to programmatically construct each network using easily reproducible methods that were consistent across networks.

Much research on gambling-related harms crosses different factor or subfactor categories. For example, a publication that focuses on mental health may also address psychological distress. We have chosen to assign authors to the factor and subfactor category that most closely align with the publication, understanding that there are sometimes secondary factors or subfactors present, but they are less central to the analyses.

\(^*\)This refers to all network visualisations in Phase 2 of this project. Note the visualisations in the Phase 1 report were created separately, using different software. As a result, there are minor differences in the appearances of the networks between the Phase 1 and Phase 2 reports.
There are many ways to measure how central a node (or author) is in a network. **Degree centrality** is the measure selected for this report. It expresses how many unique people with whom an author has collaborated.

An advantage of degree centrality is that it is relatively easy to interpret. Further, it is directly relevant to understanding the connectedness of research networks.

The networks have been visualised such that the connections between nodes are meaningful, but the distances between them are not. So, although some nodes may appear close together, there is no relationship between nodes that are unconnected by a link.

We provide statistics for **node counts** and average degree in the visualisations that follow.

Each node (appearing as a circle) represents an author, whether based in the UK or elsewhere. A **node count** is a count of all UK-based authors and their international coauthors who have published papers related to the scope of the network or subnetwork.

The **average degree** of a network is the average number of unique coauthors each author has in the network. Effectively, it indicates how collaborative each network is. The greater the level of collaboration within the network, the higher the average degree.
Approach: Social Network Analysis

A guide to the visualisations

We begin by presenting the countries where coauthors are based. This is followed by network visualisations of UK researchers and their internationally-based coauthors whose publications align with the Framework of Harms. The number of collaborations for each author is assessed by using degree centrality to enhance understanding of coauthor networks and research capacity for the Framework factors and subfactors.

Each node (or author) is colour coded by geographic location. Author nodes are symbolised by circles. The size of each node varies depending on the number of coauthors they have published with both nationally and internationally. Nodes are linked by lines or "edges" of varying thickness. Edges represent relationships (in this case coauthorships). The edge thickness indicates the number of coauthorships that have occurred between two coauthors. Legends provided for each visualisation include a number count of coauthors based in the UK and in other countries.

All visualisations show the alignment of coauthors to the Framework by institutional affiliation. Authors affiliated with an institution in the UK are designated by a blue colour code. To enhance clarity, only the nine countries with more than ten international coauthors were assigned a specific colour code that is consistent across visualisations. For example, coauthors from the United States have a green colour code and Spanish coauthors are depicted in gold. Coauthors in countries with fewer collaborations with UK-based coauthors are assigned a grey colour code and labelled as "other".

Although most nodes are linked to others, some are unconnected. These represent a UK sole-author publication.
Findings: International coauthor networks relevant to the Framework of Harms
Findings

Where were international coauthors based?

The 287 gambling harms researchers affiliated with an institution in the UK collaborated with 394 coauthors from 35 other countries. Nine countries had more than 10 coauthors: USA (79), Italy (54), Australia (51), Canada (37), Spain (31), Finland (19), Germany (14), Hungary (12), and Denmark (11). Eighty-six researchers from 26 countries represent the ‘other’ category. The highest percentage of international coauthors were based in Europe.

<table>
<thead>
<tr>
<th>CONTINENT (n)</th>
<th>COAUTHORS’ COUNTRY OF AFFILIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe (188)</td>
<td>Italy, Spain, Finland, Germany, Hungary, Denmark, Greece, France, Sweden, Netherlands, Portugal, Ukraine, Ireland, Belgium, Switzerland, Czech Republic, Luxembourg, Austria</td>
</tr>
<tr>
<td>North America (116)</td>
<td>USA, Canada</td>
</tr>
<tr>
<td>Oceania (59)</td>
<td>Australia, New Zealand</td>
</tr>
<tr>
<td>Asia (25)</td>
<td>India, Malaysia, Taiwan, China, Japan, Turkey, Hong Kong, Singapore, Saudi Arabia,</td>
</tr>
<tr>
<td>Africa (4)</td>
<td>South Africa, Kenya, Ghana</td>
</tr>
<tr>
<td>South America (2)</td>
<td>Brazil</td>
</tr>
</tbody>
</table>
This visualisation represents the links between all UK authors and their coauthors in other countries. There were 681 nodes, and the average degree was 9.924. It shows the full network of coauthors, whether clusters of authors are tightly linked, and the nationalities with whom UK-based authors most often collaborate.

The US and Australian coauthors are dispersed throughout the network, indicating a broader range of international collaboration mediated by UK author collaborations. By contrast, coauthors from countries such as Italy, Canada, Spain, and Finland appear in tighter clusters. This suggests that research groups from these countries may have formed and collaborated with UK researchers to investigate specific gambling harm interests relevant to the Framework.
Findings

Resources

The Resources category consists of three subfactors: work and employment, money and debt, and crime. Examples of harms could include job loss, financial insecurity, and crimes committed to support gambling activities.
In total, the Resources factor represented 8.96% of authors. There were 61 nodes, and the average degree was 3.607.

Fifty coauthors were based in the UK, four in Australia, three in the US, and four in the 'other' country category. Given the low number of international researchers in the network, coauthors based in the UK collaborate substantially more often with each other than with researchers based elsewhere. Overall, though, there is a low level of collaboration in the network.

Most of the researchers involved in multiple collaborations with UK authors are also based in the UK, with the exception of three Australian researchers positioned on the left side of the visualisation. This suggests that the flow of expertise to and from the UK is the most limited for the Resources factor.
The Work and Employment subfactor of Resources examines topics such as unstable employment, reduced performance at work, and job loss. This subfactor represented the fewest authors in the network (1.03%) and the smallest average degree (1.429). There were 7 nodes in total.

Five nodes represent UK-based authors, with two nodes representing coauthors based in other countries. There are three small research groups, and none are connected with another. Work and Employment is clearly an area that would benefit from additional study and greater recognition of the importance of this subfactor within the UK. UK research networks could be further extended to include researchers from countries such as the US, Canada, Australia, and Sweden, where more research on gambling harms has been undertaken for casino employees\textsuperscript{13,14,15,16} and other employment sectors\textsuperscript{17,18}. 
The Money and Debt subfactor of Resources examines topics such as financial insecurity, reduced disposable income, and debt. This subfactor represented 5.73% of authors. There were 39 nodes, and the average degree was 3.436.

Most coauthors (31) were based in the UK, and eight were affiliated with international institutions. There are several smaller research groups, and one large, more densely connected cluster with coauthors from the UK, Australia, and the US. Within this cluster, at least four UK-based coauthors and two Australian researchers provide a “bridge” to other research groups. This means they connect groups of researchers that would otherwise be unconnected. This creates strong potential for the flow of expertise from one group to another.

While the UK authors are making important advances in this area, the overall network size for Money and Debt is small and could be expanded to build the evidence base.
Findings
Framework factor alignment, Resources – Crime, 2008-2019

The Crime subfactor of Resources includes topics such as anti-social behaviour and crimes committed such as theft, fraud, and assault. With only 2.94% of authors in total, this subfactor was not well represented either. There were 20 nodes, and the average degree was 3.500.

The 19 UK researchers collaborated almost entirely amongst themselves. Two research clusters included UK authors only, and the third included one international researcher based in Australia.

In general, crime related to gambling has not been studied extensively, but there are researchers in Australia, Scandinavia, US, and Canada who have been active in this area. It may be possible to draw upon their expertise to assist in expanding the evidence base for the UK.
Findings

Relationships

The Relationship factor includes two subfactors: partners, families, and friends; and community. Examples of harms in this area would be disrupted, neglected, and exploited relationships. Harm to community may be experienced as a reduced sense of belonging and community engagement, and heightened community inequality.
Findings


The Relationships factor represented 9.69% of authors. There were 66 nodes, and the average degree was 5.121.

Unlike the Resources factor and subfactors, the international coauthors in this network (n = 39) outnumbered their UK counterparts (n = 27). In some clusters, a single UK author was part of a research group with coauthors based in another country (e.g., Finland) that had no other connections with UK-based researchers. The largest cluster is more diverse, with Italian, Australian, and Spanish coauthors collaborating with a small number of UK researchers. However, there were not many collaborations amongst internationally-based coauthors within that cluster. Thus, when UK researchers collaborate on this factor, they tend to collaborate with one other nation at a time. Additionally, it seems that the UK coauthors in this cluster are well recognised for their specific expertise and serve as bridges in the international research community. Many of them have larger nodes and are also linked to several UK coauthors. This allows them to not only share UK expertise internationally, but also take expertise gained from international collaborations and extend it to others within the UK.
This subfactor addresses harms from gambling that affect personal relationships such as divorce or separation, domestic violence, loss of trust, and relationship stress. It accounted for 6.61% of authors overall. There were 45 nodes, and the average degree was 5.556.

The number of international coauthors (n = 26) exceeds that of coauthors based in the UK (n = 19). Although the greatest number of coauthors from a single country are based in Italy, they mainly work with only one UK researcher. Similarly, a cluster with five Finnish coauthors includes only a single UK coauthor. With few exceptions, the other international coauthors work with more than one coauthor based in the UK. It seems that there is a small group of highly active UK coauthors who, as a triad, bridge to multiple, different international clusters.

There is a moderate degree of collaboration with only two dyads, one cluster with four UK-based researchers, and all international coauthors included in the larger cluster.
The Community subfactor examines areas such as increased use of community services, reduced social capital, and lower levels of connectedness to cultural relationships. This subfactor was not well represented, with only 3.82% of authors. There were 26 nodes, and the average degree was 3.385.

Twelve coauthors were based in the UK and 14 internationally. Four triads and two larger clusters were represented along with one solo author. The number of internationally-based researchers who collaborated with a UK-based coauthor was highest for Australia and constituted two research groups. None of the groups is connected to another, accounting for the low level of collaboration in the network.
Findings

Health

Gambling harms are associated with diminished health in different ways. The subfactors of the Health domain include physical health, mental health, and psychological distress. Examples of harms that might be experienced are lower levels of health and well-being, and reduced happiness at individual, family, and community levels.
Findings

Framework factor alignment, Health - overall, 2008-2019

Harm to health from gambling has received the most attention from researchers based in the UK and elsewhere.\textsuperscript{33-35} Fully 86.78\% of coauthors have publications attributed to this factor. There were 591 nodes, and the average degree was 10.606.

All countries with which UK researchers collaborate are represented in this network. The greatest number of international coauthors (n = 80) is associated with the ‘other’ country category, followed by the US, Italy, Canada, Australia, and Spain. The American and Australian coauthors are widely distributed across the visualisation, whereas coauthors from the other countries have denser research clusters.

Health, specifically mental health, is a well-established area of gambling studies research. Research groups extend internationally, and many coauthors have multiple links to other coauthor groups.
This subfactor focuses on gambling harms related to physical health. It can include issues such as poorer nutrition, higher blood pressure levels, and less engagement in physical activity. The Physical Health subfactor represented 11.01% of authors. There were 75 nodes, and the average degree was 11.760.

Twenty-four coauthors were based in the UK, and the remaining 51 were affiliated with international institutions. The strongest representation was from Italy, although this is due to 25 of the 26 Italian coauthors participating on a single publication. Although there were fewer researchers from other countries, they too stayed within a single research cluster, with the exception of US coauthors. Although the Physical Health network has the highest average degree out of all factors and subfactors, results from a single outlier paper (with the 25 Italian coauthors) dramatically affect the score given the relative size of the overall network. For example, if the single paper with 25 Italian coauthors and one UK coauthor was removed, the average degree of the network would drop to 4.640. This average degree may more accurately reflect the moderate level of collaboration on Physical Health research displayed by the rest of this network.
Findings

Framework factor alignment, Health – Psychological Distress, 2008-2019

The Psychological Distress subfactor examines harms such as feelings of guilt, shame, and stigma. It accounts for 7.34% of authors. There were 50 nodes, and the average degree was 9.760.

Equal numbers of coauthors were based in the UK and in Canada. The Canadian researchers, with the exception of two, are coauthors on a single publication with one UK-based researcher. Similar to the Physical Health subfactor, the high number of authors on a single paper act as an outlier that has had a disproportionate influence on the average degree, which represents the level of collaboration. If this single outlier paper was removed, the average degree of the network would drop to 4.710, which may be more representative of the moderate amount of collaboration seen throughout the network.

This network is more dependent than others on bridging authors (i.e., those that connect otherwise separate groups of authors). These bridging authors may have access to broader ranges of information because they are connected to distinct research groups. They can also facilitate the transfer of knowledge and expertise across the network.
Findings

Framework factor alignment, Health – Mental Health, 2008-2019

Harms related to mental health range from increased depression and anxiety to suicide. This subfactor accounts for 74.30% of gambling harms authors. There were 506 nodes, and the average degree was 9.917.

Coauthors based in the US have been most active in research collaborations with UK researchers when compared to other countries. Even so, there is also a substantial exchange of expertise with coauthors affiliated with institutions in Australia and Spain. Australian and US coauthors are well-distributed throughout the network, whereas Spanish coauthors are mostly affiliated with one large cluster. Although there are fewer coauthors from Italy, Germany, and Canada, they are more widely dispersed across the network, whereas Finland is more localised. Wider dispersal indicates multiple collaborations are taking place; by extension, localised groups suggest more limited collaboration. The lack of distinct UK clusters suggests that UK mental health harms research is well integrated, either directly or indirectly, with the international research community.
Summary of author distribution, number of authors, and average degree in Framework factor and subfactor networks

<table>
<thead>
<tr>
<th>Factor/Subfactor</th>
<th>% of authors (nodes)</th>
<th>Number of authors</th>
<th>Average degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources</td>
<td>8.96</td>
<td>61</td>
<td>3.607</td>
</tr>
<tr>
<td>• Work and employment</td>
<td>1.03</td>
<td>7</td>
<td>1.429</td>
</tr>
<tr>
<td>• Money and debt</td>
<td>5.73</td>
<td>39</td>
<td>3.436</td>
</tr>
<tr>
<td>• Crime</td>
<td>2.94</td>
<td>20</td>
<td>3.500</td>
</tr>
<tr>
<td>Relationships</td>
<td>9.69</td>
<td>66</td>
<td>5.121</td>
</tr>
<tr>
<td>• Partners, families, and friends</td>
<td>6.61</td>
<td>45</td>
<td>5.556</td>
</tr>
<tr>
<td>• Community</td>
<td>3.82</td>
<td>26</td>
<td>3.385</td>
</tr>
<tr>
<td>Health</td>
<td>86.78</td>
<td>591</td>
<td>10.606</td>
</tr>
<tr>
<td>• Physical health</td>
<td>11.01</td>
<td>75</td>
<td>11.760*</td>
</tr>
<tr>
<td>• Psychological distress</td>
<td>7.34</td>
<td>50</td>
<td>9.760*</td>
</tr>
<tr>
<td>• Mental health</td>
<td>74.30</td>
<td>506</td>
<td>9.917</td>
</tr>
<tr>
<td>All factors/subfactors</td>
<td>100.00</td>
<td>681</td>
<td>9.924</td>
</tr>
</tbody>
</table>

This table allows general comparisons both within and between factors and subfactors, which are reviewed on the following pages. Note that the total subfactor nodes and percentages within each primary factor exceeds the factor total due to the presence of authors assigned to multiple subfactors.

*As noted previously, the average degrees for these two subfactor networks are highly skewed due to single outlier papers with many coauthors. If these outlier papers were removed, these networks would have average degrees in the 4.6-4.7 range. Removing these two outlier papers would also slightly reduce the average degree of the overall Health network from 10.6 to 9.6. However, even with these removals, the overall Health network remains the most well-connected of the Factors.
Discussion: What have we learned about international collaboration with UK-based researchers?
Discussion

Number of peer-reviewed publications related to gambling harms

The 276 peer-reviewed publications in the final dataset yielded 681 coauthors, 287 of whom were based in the UK from 2008 to 2019, or for at least part of that time. Some UK-based authors had changed affiliations during the 12-year period and were subsequently employed internationally. For these coauthors, we retained their original UK affiliation due to software limitations and, as was often the case, continued collaborations with UK-based authors.

The modified PRISMA flow diagram shows that 1,069 of 1,323 publications assessed for eligibility were excluded from the final analysis. Half were related to gambling but not to gambling harms (n = 534), while the other half were out of scope for other reasons. Therefore, just over one-third (34.1%) of publications related to gambling could be directly linked to gambling harms.

Many excluded publications addressed gambling-related topics such as etiology of problem gambling and research methodologies. While these topics are essential to gambling studies, it is helpful to monitor the number of gambling harms research publications and their coauthor networks, especially when an evidence base is needed to support the Framework. The visualisations reveal gaps in many Framework factor areas. They also show how networks that include international scholars can extend the range of coauthor expertise.
Discussion

International collaborations

- For UK-based researchers, almost half of all their international collaborations are with researchers affiliated with European institutions. Geographic proximity means that they may be more likely to attend the same conferences or other events where they would have opportunities to interact and develop or strengthen research networks. About three in ten coauthors were based in North America. Oceania, with a much smaller population, was represented by 15% of coauthors, attesting to the depth of the gambling harms expertise they contribute to the UK context.

- It is encouraging that UK researchers coauthored publications with researchers in 35 other countries. Although most internationally-based coauthors were concentrated in high-income, English-speaking nations, there were publications that included coauthors from countries such as Malaysia or Taiwan, where there is a longer tradition of gambling as a recreational activity. It could also be partially attributed to collaborations with the University of Nottingham Malaysia.

- Researchers based in the UK collaborated extensively with international coauthors for publications assigned to the Health factor. It is the most established area of gambling studies research and well supported by regular conferences and several psychology and addiction journals. These events and outlets expose researchers to new and established scholars elsewhere and can help to build research networks.

- There were several examples of coauthor clusters within networks that included only one UK-based author (or vice versa). This can occur when a coauthor has moved from an international institution to one located in the UK and maintains an active research relationship. In some cases, coauthorship may involve an exchange of access to an existing dataset, expertise, or other resources for which coauthorship is an agreed-upon arrangement. Or it may simply represent a personal relationship between researchers with shared interests.
Discussion

Framework factor coverage

• The primary factors of Resources, Relationships, and Health can offer insights into gambling harms research expertise and the extent to which UK-based coauthors work with others in international locations.

• The Resources factor was characterised by few collaborations between UK-based researchers and their international colleagues. This could occur for a number of reasons. It may be that funding opportunities requiring international participation are more limited in this factor area; or it could be that the substantive content for Resources (i.e., money and debt, work and employment, and crime) favours country-specific projects. Collaborations may be more meaningful, effective, and easily facilitated when institutional systems under investigation are subject to the same jurisdictional policies and regulations.

• Although the number of coauthors for the Relationships factor was similar to the Resources factor, UK-based researchers collaborated with international coauthors far more often on Relationships research than Resources. Even though the amount of research is limited for harm to relationships, international collaborations have greatly expanded the network allowing a stronger flow of expertise, especially for harm to partners, families, and friends.

• The Health factor has received the most research attention from both UK researchers and their international coauthors. Studies with a psychological focus, including those assigned to mental health and psychological distress subfactors, have accounted for the highest percentage of gambling studies publications in the UK and many other countries for several years. National and international coauthor collaborations for the Health factor are well developed.
Subfactor coverage

• Based on the Phase 1 findings and other bibliometric studies, it was expected that international research collaborations would be the highest for the Mental Health subfactor. Harm attributed to this subfactor has long been the focus of gambling research, which has resulted in the most extensive ties to coauthors internationally and within the UK.

• Research on harm to Physical Health has been given less attention by UK researchers. Even though the average degree of this network (which is indicative of the level of collaboration) was the highest of all subfactors, it is distorted by one publication with 26 total coauthors. Removal of this single publication reduces the average degree by more than half. Expanding international collaborations for this network could help to address the research gap identified in a World Health Organisation (WHO) call for more evidence of gambling-related harms to physical health.

• The Resources subfactor, Money and Debt, received little attention in academic publications within our search period (i.e., 2008-2019), with a few academic papers being published since then (e.g., see work by Muggleton and colleagues and Collard and Kross). This subfactor is linked to the financial harm domain of the Conceptual Framework of Gambling Harm, developed by Australian researchers. Financial harm has been identified by international experts as an important precursor to other types of harm from gambling, including relationship conflict and psychological distress. Expanding the evidence base for this subfactor could have a substantial impact on addressing other types of harms. The UK is active in involving financial institutions in harm prevention and mitigation strategies. Reports appear in the grey literature (e.g., see Evans, Collard, and Fitch’s report on bank card blockers and GamCare’s work on gambling-related financial harm), so there is expertise that could be further supported and shared internationally.

• Harm to communities is a developing research area in the UK and internationally. Australia, Canada, and the US have a larger evidence base, although much of their community-related research is focused on Indigenous Peoples. One challenge is the complexity of defining ‘community,’ and whether it represents communities of place, shared interests, broader social groups, or other factors.
**Future Directions:** How can this information be applied?

Considerations for international collaborations in support of the National Strategy to Reduce Gambling Harms
Future directions

Building research expertise

Global networks of gambling harms coauthors for researchers based in the UK are concentrated in Europe, North America, and Oceania. Digital technologies enhance opportunities to extend networks elsewhere, but researchers may be more comfortable with or reliant on personal networks that are self-initiated or facilitated by past opportunities to meet in-person at conferences or other academic events. Programmes such as visiting scholars, academic exchanges, and research funding opportunities requiring international participation could boost the size and strength of coauthor networks.

It is important to remember that the exchange of expertise is bi-directional in research collaborations. International gambling studies scholars also benefit by participating in research collaborations with UK-based coauthors who bring new insights, experiences, and perspectives to gambling harms research.

We did not expect that all factors and subfactors would be equally represented. For example, there is a strong emphasis on Mental Health. This has no doubt occurred since gambling studies research in the UK and internationally has typically aligned in the past with the medical model of gambling policy as opposed to the public health model. Many publications assigned to Relationships and Resources sit squarely in the public health domain which has received less attention to date.

Research expertise could be expanded through strategic government funding to better support each subfactor and by drawing upon both local and international expertise. Since the evidence base is limited, research for specific harms may need to be prioritised. Consistent with the public health approach, prioritisation would require input from multiple stakeholders to establish an agreed-upon direction.
Future directions

Extending research expertise

Ensuring sufficient research expertise to support the Framework is a challenge for stakeholders in the UK and elsewhere. Gambling research competes for funding with many other public health issues such as the COVID-19 pandemic, tobacco, alcohol, and other types of substance use problems. Even so, supporting new and existing collaborations is an important part of developing an evidence base to effectively address harm from gambling. The Resources and Relationships factors are under-researched and would benefit from more research collaborations, both locally and internationally, to advance knowledge in these areas.

There are encouraging signs of progress in the UK to address gambling harms as a public health issue despite the limited evidence base for some Framework factors. For example, gambling harm prevention and education reviews that link to multiple Framework factors have been supported recently by the National Institute of Health Research, the Office for Health Improvement and Disparities, and Creo (in collaboration with the Gambling Commission). More directed funding is needed, especially from National Research Councils, to develop and sustain research programmes and collaborations.

Extending researcher networks to include international coauthors creates conditions to capitalise on their strengths and expertise. These researchers may be affiliated with institutions in other countries where the public health approach to addressing gambling-related harms is better established as a research and policy priority, such as Australia (e.g., the Victorian Responsible Gambling Foundation public health focus), and New Zealand (whose government views gambling as a public health issue, which is addressed in the 2003 Gambling Act). UK-based researchers can benefit from expertise regarding approaches to the conceptualisation and measurement of gambling-related harms developed in other jurisdictions.
Limitations

As with any research report, there were some limitations:

- The literature searches for this study were last updated in 2020. As a result, any relevant papers published since then could not be included in the analysis.

- The gambling studies grey literature was excluded from the analysis but could be included in future studies of research networks since it sometimes differs in research focus when compared to academic publications.53

- Although UK-based researchers were able to check for missing data related to their own publications, it may be that relevant studies associated with harm from gambling by other authors were not returned through the search.

- Much research on gambling-related harms crosses factor categories, making it challenging to determine primary factor and subfactor alignment. It is possible that some citations could have been inadvertently miscategorised.

- This analysis focuses on the number of authors researching each factor, and not the number of publications per factor. This is a strength in terms of understanding how many researchers are collaborating on each factor and who they are collaborating with. However, it is also a limitation in that the visualisations do not indicate the number of publications per factor, which may be more representative of the amount of research being performed on each factor.

- Finally, our analyses focused on the average degree of each network, which represents the overall level of collaboration within a network. However, the level of collaboration may not be evenly distributed throughout a network. For example, some networks can have a few individuals who are highly connected, and many individuals who have only one or two connections. Future work could include additional network measures, such as network ‘centralization’ measures, which may provide further insights into how reliant networks are on a few key individuals to hold the network together.54
Summing up

This Phase 2 report extended the work completed in Phase 1, where the depth and breadth of UK-based researcher expertise for each of the Harms Framework factors and subfactors was presented. In Phase 2, information about collaborations with researchers at international institutions was examined to better understand not only the extent of coauthor networks, but also the international locations of authors with whom factor and subfactor interests are shared.

Overall, the Phase 1 and Phase 2 reports demonstrate the factors and subfactors for which coauthor networks could be developed further, both in the UK and in collaboration with international experts. More attention to these areas would help to ensure that a robust network of researchers concerned with gambling-related harms is in place to strengthen the evidence base to support priorities of the National Strategy. This research also revealed networks of coauthors with strong ties, particularly for harm to mental health, that are well positioned to continue advancing knowledge of gambling-related harms.

Since gambling studies is a relatively small field, there are implications for research capacity development through international collaborations. Visiting scholar programmes, formalised institutional relationships to facilitate training, and access to international research expertise through other avenues are important to consider for factors and subfactors where UK-based expertise is limited, and where international scholars may benefit from collaborations with coauthors in the UK.
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