RESEARCH PAPER

Understanding the Research–Policy Divide for Oral Health Inequality

Comprendre le rôle des disparités entre recherche et politiques dans les inégalités en santé buccodentaire

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Abstract

Background: No studies exist of the congruence of research in oral health to policy. This study aimed to examine the broad congruence of oral health research to policy, and implications for developing oral health research that is more policy relevant, particularly for the wider challenge of addressing unequal oral health outcomes, rather than specific policy translation issues.

Methods: Bayesian-based software was used in a multi-layered method to compare the conceptual content of 127,193 oral health research abstracts published between 2000-2012 with eight current oral health policy documents from Organisation for Economic Co-operation and Development countries.
Findings: Fifty-five concepts defined the research abstracts, of which only eight were policy-relevant, and six of which were minor research concepts.
Conclusions: The degree of disconnection between clinical concepts and healthcare system and workforce development concepts was striking. This study shows that, far from being "lost in translation," oral health research and policy are so different as to raise doubts about the extent to which research is policy-relevant and policy is research -based. The notion of policy relevance encompasses the lack of willingness of policy makers to embrace research, and the need for researchers to develop research that is, and is seen to be, policy-relevant.

Résumé

Contexte : Il n'y a pas d'étude sur la congruence entre la recherche et les politiques en matière de santé buccodentaire. Cette étude vise à examiner la congruence générale entre la recherche et les politiques en matière de santé buccodentaire ainsi que ses répercussions pour le développement de recherches plus pertinentes pour les politiques, particulièrement face aux grands défis d'inégalités en matière de santé buccodentaire, plutôt qu'en fonction d'enjeux touchant au transfert des politiques.
Méthode : Nous avons employé un logiciel de type bayésien pour effectuer une comparaison multiniveau entre, d'une part, le contenu conceptuel de 127 193 résumés de recherche en santé buccodentaire publiés entre 2000 et 2012 et, d'autre part, huit documents actuels de politiques en matière de santé buccodentaire provenant de pays membres de l'Organisation de coopération et de développement économiques.
Résultats : Cinquante-cinq concepts définissaient les résumés de recherche, dont seulement huit étaient pertinents pour les politiques et six présentaient des concepts de recherche mineurs.
Conclusions : Le degré de disparité est frappant entre, d'une part, les concepts cliniques et, d'autre part, les concepts touchant au système de santé et au développement de la main-d'œuvre. Cette étude montre qu'au-delà de se perdre dans les processus du transfert, les politiques et la recherche en santé buccodentaire sont tellement différentes qu'on en vient à douter de la pertinence politique des recherche et du bien fondé scientifique des politiques. La notion de pertinence politique comprend le manque de volonté de la part des responsables de politiques d'adhérer à la recherche tout comme le besoin pour les chercheurs de développer des projets qui sont (et semblent) pertinents du point de vue des politiques.

Policy studies are defined as scholarly, peer-reviewed analyses of the nature of the processes by which policy is formed and such studies form a small but growing body of work within the oral health literature. As of May 24, 2013, there were 1,213 items in PubMed with the terms "oral health" OR "dental" OR "dentist" OR "periodontal" AND "policy" – terms that are likely to capture broad oral health research, as well as explicit policy, content. A total of 762 of these items had been published since 2000. A far smaller set focussed on the translation of research into practice (Rogers 2012): improving the translation of data from clinical trials (Barnett and Pihlstrom 2004), for clinical guidelines (Clarkson 2004; Clarkson et al. 2010) and for specific challenges such as women's oral health (Daley et al. 2013).

Currently, no studies exist of the congruence of oral health research to policy, nor of the implications of this congruence for developing more policy-relevant oral health research. Between 2000 and 2012, at least 127,193 unique papers with abstracts were published in oral health. This body of literature has not been systematically analyzed for its content relevance to oral health policy priorities. A focus on the content of this literature is particularly relevant to the study of evidence translation. While a quality hierarchy influenced by the "blue chip" standard of randomized controlled trials dominates health sciences research, health policy research suggests that the congruence of research content to policy may be more important than research methodology in policy take-up of research (Bell 2010; Dobbins et al. 2007a, 2007b; Mays et al. 2005; Sorian and Baugh 2002).

If the content of research can be determined through research databases, indicative evidence of oral health policy priorities exists in the form of oral health policy statements produced by governments. In our previous study (Bell and Seidel, 2012), we explored how disadvantaged groups are represented in oral health policy statements from Organisation for Economic Co-operation and Development (OECD) countries. We found that concepts for "vulnerable or disadvantaged groups are usually, but not always, the least frequent concepts" in these documents. The current study describes the conceptual content of the entire corpus of oral health research abstracts from 2000 to 2012 and compares this content to that of oral health policy documents. The study aims to build an understanding of the nature of the research–policy divide so that research can better serve policy efforts to address oral health inequity.

Method

This study used Leximancer semantic analysis software developed at the University of Queensland, Australia (https://www.leximancer.com/). It is useful for researchers who need to explore large text-based data sets. Leximancer is a Bayesian-based application of computational linguistics in which "machine learning" methods are applied to the analysis and synthesis of language. We compared two different samples. The first sample was 127,193 oral health abstracts published from January 1, 2000 to December 31, 2012, treated as indicative of all

oral health research. The second sample comprised government oral health policy documents, published between 2004 and 2012, from eight OECD countries. A quantitative content analysis was performed using the Leximancer software to describe the changing content of oral health research, by year, from 2000 to 2012. This was compared with the results of the same procedure for analyzing the content of the eight policy documents.

Research questions

The research questions were "How well matched is the content of research to oral health policy?" and "What are the implications of this for developing oral health research that is more policy relevant, particularly for the challenge of addressing unequal oral health outcomes?"

Oral health literature sample

The oral health abstracts were obtained using search terms in the Scopus database as follows: "oral health" OR "dental" OR "dentist" OR "periodontal." The terms were developed in discussion with oral health practitioners to avoid the systematic exclusion of a large corpus of oral health literature. The sample of abstracts was designed to be sufficiently large and the findings sufficiently broad so as not to be substantively different with the addition of more specific words. One difficulty in having too large a sample size is that as the number of found concepts increases, the concept map becomes too detailed, and the manual checks become impractical, yet often the substantive broad findings do not change. The addition of the word "caries," for example, increases the sample size but only by 4%, and separate analysis of that relatively small corpus does not change the findings obtained from the broad sample that includes 15,928 abstracts containing the word "caries" and the chosen search terms.

The available evidence suggests that the Scopus database offers 20% more coverage than Web of Science; PubMed being better for biomedical sources, and Google Scholar being less accurate (Falagas et al. 2008). Scopus is therefore the largest abstract and citation database of peer-reviewed literature in the world, including for all countries in this study. Yet the study is not a review of databases but rather an analysis of one highly authoritative database. The research database search period began on January 1, 2000; the earliest date for the policy sample search was 2004 to allow for a reasonable lag time for the translation of research into policy. The results of both searches were exported as CSV files in manually set batches of 2,000 abstracts (a download limitation of Scopus). The downloaded abstracts were subsequently added to a SQLite database to generate CSV files with abstracts for a full year. This procedure involved manual checks of data consistency and removal of duplicate abstracts. Table 1 provides the number of unduplicated abstracts, published by year, for the sample of 127,193 abstracts.

TABLE 1. Number of oral health research abstracts, by year, from 2000 to 2012

Year	Number of research abstracts
2000	6,073
2001	5,624
2002	6,566
2003	8,417
2004	9,504
2005	10,084
2006	10,153
2007	11,125
2008	12,057
2009	11,714
2010	12,127
2011	11,570
2012	12,179
Total	**127,193**

Oral health policy sample

The oral health policy documents published between 2004 and 2012 came from Wales (WG 2012; a draft report), the United States (CDC 2011), Northern Ireland (DHSSPS 2007), New Zealand (MOH 2006), Canada (FPTDDWG 2005), England (DH 2005), Scotland (SE 2005) and Australia (NACOH 2004). These oral health policy documents, like the abstracts, were treated as indicative evidence, i.e., of oral health policy understandings, not necessarily what has been implemented. Our previous study of the representation of disadvantaged groups in oral health policy (Bell and Seidel, 2012) used criteria from other international comparative studies to define a policy statement as follows:

- "current statements in English (not in languages other than English unless an English version of the statement is also available);
- statements by government agencies (not health professional associations or other organisations);
- explicit policy guidelines and planning statements, such as oral health plans, strategies and vision documents (not oral health implementation or activities reports or indicators for oral health system performance or policy recommendations in oral health research reports etc.);
- national (not international, multi-country, state or provincial) policy statements; and
- 'stand-alone' oral health policy documents (not general health policy documents or health policy documents with a single oral health section)."

These criteria resulted in a total of eight documents yielded by searches of the websites of agencies in 34 OECD countries and follow-up queries for publicly available documents. Non-sovereign countries, i.e. of the United Kingdom, were included as were draft documents (WG 2012) if they met the sample criteria. Snowballing techniques scrutinizing the applied and scholarly literature also were applied to confirm the sample set. Accordingly, the study was not a study of the multi-faceted politics that influence dental care systems and their development, and the roles of professional and consumer groups in policy advocacy. Rather, it was a study of the translation of scholarly oral health research into oral health policy statements as they relate to health inequalities.

Analytic procedure

OVERVIEW

The analytic procedure had two stages: (1) mapping concepts in the research abstracts and then the policy documents, and (2) manually comparing these two sets of concepts. These analyses were performed using the Leximancer software (version 4). In Leximancer, the unit of analysis is a "text block" about the length of a paragraph. The software is able to learn from a corpus of uploaded texts in an iterative fashion. The analysis creates a network of Venn diagrams as a spatial representation of interconnected concepts — a concept map.

The technical aspects of the Bayesian-based Leximancer software have been explored in validity studies (Smith and Humphreys 2006) and in hundreds of applications (Baker et al. 2011; Cretchley et al. 2010; Hepworth and Paxton 2007; Hewett et al. 2009; Kuyini et al. 2011; Kyle et al. 2008; Pakenham et al. 2012; Travaglia et al. 2009). The algorithm-based nature of Leximancer draws on the discipline of computational linguistics. Leximancer has been defined as an automated approach to transforming co-occurrence information about words into semantic patterns. The algorithms used in Leximancer involve machine learning as summarized in the technical validity study.

A unified body of text is examined to select a ranked list of important lexical terms on the basis of word frequency and co-occurrence usage. These terms then seed a bootstrapping thesaurus builder, which learns a set of classifiers from the text by iteratively extending the seed word definitions. The resulting weighted term classifiers are then referred to as concepts. Next, the text is classified using these concepts at a high resolution, which is normally every three sentences. This produces a concept index for the text and a concept co-occurrence matrix. By calculating the relative co-occurrence frequencies of the concepts, an asymmetric co-occurrence matrix is obtained. This matrix is used to produce a two-dimensional concept map via a novel emergent clustering algorithm. The connectedness of each concept in this semantic network is used to generate a third hierarchical dimension, which displays the more general parent concepts at the higher levels (Smith and Humphreys 2006).

The usefulness of the software lies not simply in its concept maps and supporting quantitative data that allow scoping of a large body of qualitative data. Leximancer also facilitates manual checks of large qualitative data sets. It provides multiple data viewing windows that allow the analyst to scrutinize the text on which the data are based, in the context of the original uploaded text. In the current study, this allowed sequential manual checking procedures to extend the machine-driven findings.

STAGE 1. MACHINE-AUTOMATED MAPPING OF THE CONTENT OF ABSTRACTS AND POLICY DOCUMENTS

In the first stage of this study, the automated Leximancer procedures were used to ensure that the two different samples – the research abstracts and the policy documents – were subjected to the same research procedure for their analysis. The research abstracts were uploaded in Leximancer to produce a concept map, and, in a separate procedure, the policy documents were uploaded in Leximancer to produce a second concept map. Concepts were therefore selected by the software with only one kind of intervention by the analyst. Meaningless concepts such as structural features of abstracts ("aims" or "conclusions") were removed as mapping concepts as were names of countries, i.e. this content was not excised but rather subsumed by Leximancer under other mapping concepts. This intervention was designed to ensure that the data output produced by Leximancer represented the conceptual content of the two different corpuses. This analysis produced concept maps showing not only the semantic placement of one concept relative to all other concepts, but also the pathways or connections across multiple concepts.

STAGE 2. MANUAL CHECKS AND COMPARISON OF CONCEPTS

In the second stage of the study, manual checks aimed to further document substantive conceptual differences and similarities between the research abstracts and the policy documents, particularly as they related to health inequity. These checks were undertaken in two steps as follows.

STEP 2.1.

A set of categories to support the manual comparisons was developed by scrutinizing all concept words – the tag word used to describe a concept by Leximancer, as identified in Stage 1. Four possible categories for the concept words were decided: (1) matching concept words (in whole or part of case) that had the same apparent meaning, (2) matching different concept words that had the same or very similar meaning, (3) matching concept words (in whole or part of case) that had a different substantive meaning and (4) identifying concept words that did not match and were most unlikely to have the same or similar meaning. All concepts from both the Stage 1 analysis of the abstracts and the policy documents were placed in these four categories.

STEP 2.2.

The qualitative data relevant to the first three categories of concept words were scanned in both the abstracts and the policy documents using Leximancer's data viewing windows. A specific data viewing window that extracted the sentence in which the concept appeared expedited the scan. The larger context of the sentence was extracted only when the meaning of the concept word in the sentence was not obvious. This exercise focussed only on obvious, not subtle, differences in meaning; for instance, the difference between the word "system" used to refer to biological systems in the research abstracts and healthcare systems in the policy documents. It also focussed on identifying whether the concept sentences belonged in the category at least two-thirds (>66%) of the time.

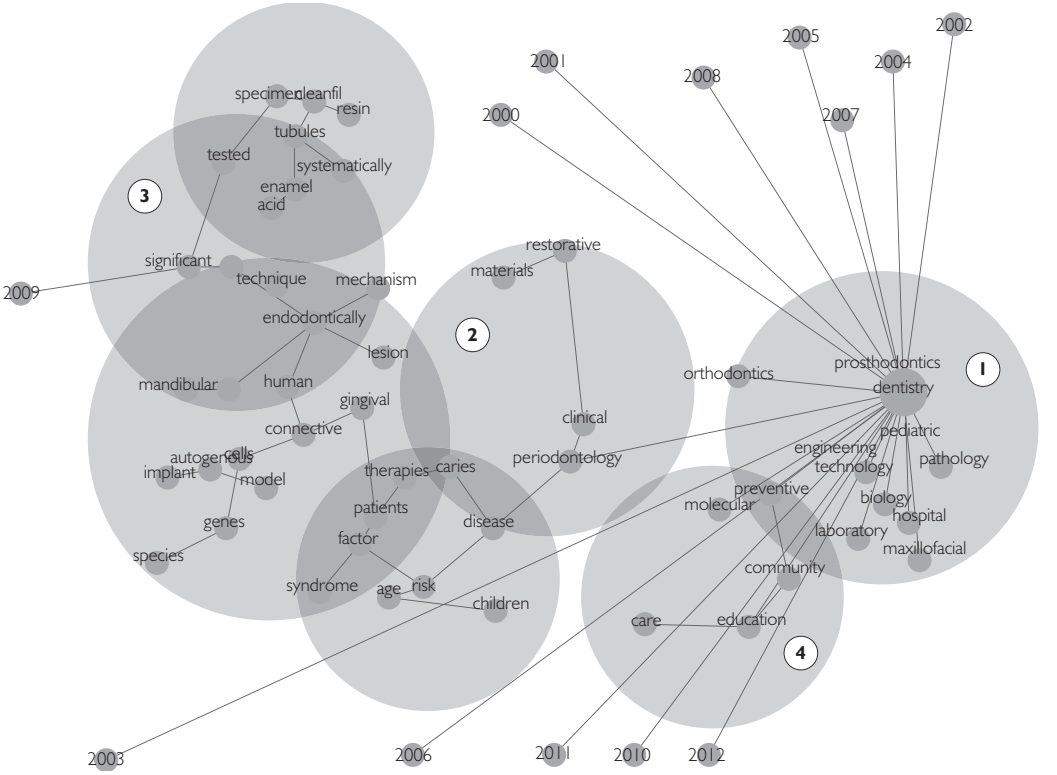
Results and Discussion

Machine-automated content mapping

Two concept maps with supporting data were produced: one map with 55 concepts for the research abstracts and another map with 33 concepts for the policy documents. In the 127,193 research abstracts, 1,604,212 instances of the mapped concepts were found by Leximancer in 1,197,367 distinct text blocks. In the policy documents, 14,612 instances of the mapped concepts were found in 3,482 distinct text blocks. The use of two different sets of data analyses, one for each data set, means that differences in the size of the data sets are not an issue.

Figure 1 illustrates the map of the 55 concepts identified in the research abstracts using the search terms "oral health, dental, dentist" and "periodontal." As is evident in Sphere #1, abstracts from all years except 2009 related directly to dentistry with immediate linkages to periodontology, clinical and restorative work (Sphere #2), and continuing pathways to less frequently occurring concepts. Abstracts from 2009 focused on the concepts of significant techniques in orthodontics (Sphere #3). When the relationships between concepts are close, the software application presents these concepts as overlapping, e.g., "significantly" and "canals" in Sphere #3. For clarity, all 55 concepts are listed individually in Table 2 (see Table 2 at www.longwoods.com/content/XXXXX). The placement of concepts in the concept map is determined by their overall co-occurrence – for an individual concept and for its relationships with all other concepts. The lines within and between the circles show the relationships among multiple concepts. The size of the dots within each circle reflects the extent to which a concept co-occurs with all the other concepts; the larger the dot, the greater the co-occurrence.

FIGURE 1. The 55 identified concepts in oral health research abstracts, by year, and their inter-relationships



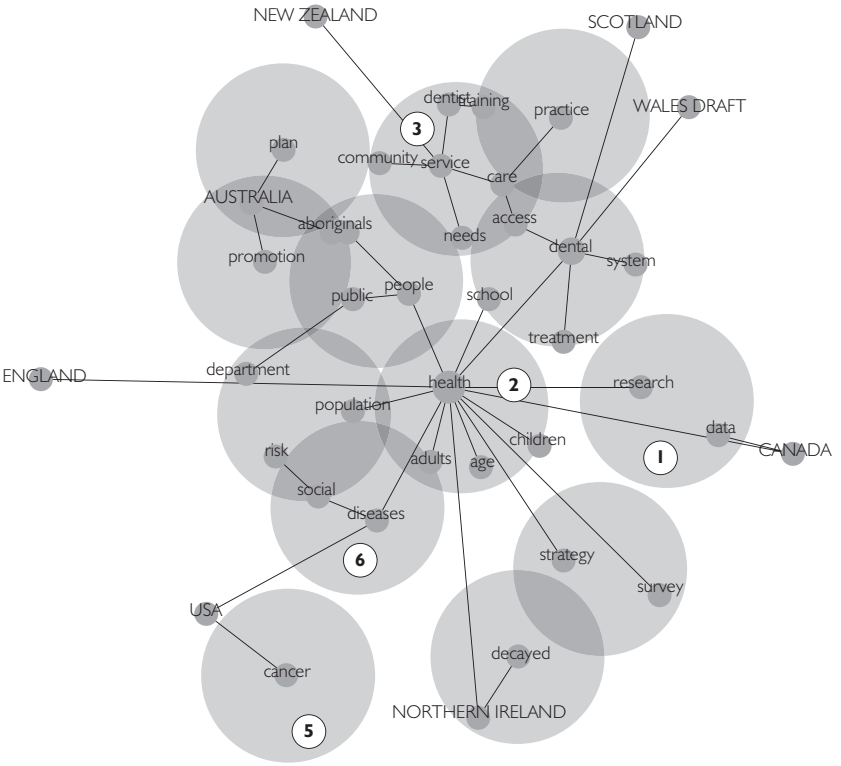
Note. The software application presents close relationships as overlapping concepts.

In Figure 1, clinical concepts, predominantly laboratory-based and clinical evidence concepts, dominate and are well-connected. Sphere #1 indicates the most frequently occurring concepts and a high degree of co-occurrence. In contrast, healthcare system and workforce development concepts, such as "care," "education" and "community," seen in Sphere #4, are less frequent and poorly connected, as suggested by the lack of lines connecting them to one another or to other concepts. This indicates that, even when healthcare system and workforce development concepts appear in research-based literature, these concepts are not part of well-developed theoretical constructs that allow connections to be developed between them and clinical research. The concept map in Figure 1 suggests a visually striking degree of disconnection between clinical concepts and healthcare system and workforce development concepts. Yet, the abstracts for the most recent years (2010–2012) are closest to the healthcare system and workforce development concepts, suggesting oral health research has included more of this kind of content in recent years.

Spheres 1 and 2 = the most frequently occurring concepts and their linkages; Sphere 3 = concepts from 2009 abstracts showing overlapping relationships; and Sphere 4 = less frequently occurring concepts with fewer linkages. All concepts are listed individually in Table 2.

Figure 2 maps the 33 concepts identified in the oral health policy documents from the eight OECD countries, and their inter-relationships. These 33 concepts also are listed individually in Table 2. The lines from each country to a particular sphere, e.g., from Canada to "data" in Sphere #1 and to "health" in Sphere #2, identify the primary concepts in the oral health policy documents of each country. The overlap between planning, promotion and aboriginal issues in oral health policy for Australia reflects a focus on indigenous issues that then links to people and health. At the time of data collection, the oral health policy for Wales was in draft form and this is noted in the Figure.

FIGURE 2. The 33 identified concepts in oral health policy documents, by country, and their inter-relationships



Note. The software application presents close relationships as overlapping concepts. Spheres 1, 5 and 6 illustrate the limited links between disease and research in policy documents. Sphere 2 shows the focus on health for people of all ages in policy documents. Sphere 3 illustrates the most frequently occurring concepts in policy documents. Sphere 4 illustrates the least frequent concepts. All concepts are listed individually in Table 2.

When compared with the concept map of oral health research abstracts in Figure 1, the map in Figure 2 suggests how much more the concept of health, not clinical dentistry concepts, is integral to policy. The more common concepts in the spheres in Figure 2 are concepts about services, care, needs, access, community and training – not clinical concepts. Where the concept of dentist occurs (Sphere #3 in Figure 2), it is proximate to the concept of training. Similarly, where the concept of dental occurs (Sphere #4), it is typically connected with the system concept.

When comparing Figures 1 and 2, it appears as if oral health research preoccupations are the opposite of policy preoccupations. Figure 1 demonstrates that clinical and disease concepts are the best connected and most frequent concepts (as the supporting data suggest), with the opposite being true of the healthcare system and workforce development concepts. In striking contrast, mapping the policy documents in Figure 2, specific disease concepts such as cancer (Sphere #5) and research and data concepts (Sphere #1) tend to be less common (as the supporting data also suggest) and less well-connected to the workforce and healthcare system concepts. Disease, as a general concept, is in fact proximate to the social concept in the policy documents, as shown in Sphere #6 (Figure 2). The data in Figures 1 and 2 raise the question of whether similar concepts in the two figures mean different things or whether apparently different concepts mean the same thing. In other words, is the content of oral health research even more different, or more similar, than these figures suggest? Manual checks comparing the substantive meaning of the different concepts allowed exploration of the answers to this question.

Manual checks and comparison of concepts

Table 2 lists the 55 concepts identified from the 127,193 oral health research abstracts and the 33 concepts identified from the eight oral health policy documents, along with their frequency and likelihood of occurrence, as documented by the Leximancer analyses. In a manual check of the data, it was not necessary to read the entire corpus of oral health research abstracts, as few of the concepts in the research abstracts actually matched or appeared related to the policy concepts. In the research abstracts, the 10 concepts highlighted in Table 2 were scanned. These 10 concepts represented a total of 488,525 sentences. In the policy documents on the right side of Table 2 also, 10 concepts were scanned. These 10 concepts represented a total of 5,372 sentences.

The data in Table 2 demonstrate that only 8 of the 55 research concepts appear policy-relevant in the sense that they mean the same as concepts used in policy language. These shared concepts are dentistry/dental, patients/people, care, disease/diseases, age, children, risk and community. However, only two of these concepts (dentistry, patients) are in the top 12 most common research concepts, whereas seven of these concepts (dental, care, people, promotion, diseases, children and community) are in the top 12 policy concepts. Only six of the eight shared concepts involve using the same concept word to mean the same thing. The concept of community is one of the least important research concepts with a likelihood of occurring 3% of the time in any one of the distinct text blocks in the corpus of abstracts. However, the concept of community is four times more likely to appear in the policy documents with an occurrence likelihood of 12%. Most concepts relevant to healthcare system and workforce development in the policy concepts in this analysis have no equivalent concept in the research concepts.

Conclusions and Implications

This study has suggested a striking degree of disconnection between oral health clinical research concepts and healthcare system and workforce development concepts. Its findings indicate that, far from being "lost in translation," oral health research and policy are so different as to raise doubts about the extent to which research is policy-relevant or policy is research-based. That is, most of the research does not appear to be policy-relevant, and most of the time, policy does not appear to be drawing on research. Measuring the research–policy divide helps to better understand the difficulty of reforming oral healthcare. It suggests not only why, but also where, research could better address the healthcare system priorities of policy makers.

In this study, the key directions for oral health research suggested by leading policy concepts lie in developing a health-based concept of oral health, informed by services and workforce development research that would allow better design of oral healthcare delivery. In so doing, this study indicates that the nature of the research–policy divide for addressing oral health inequality is not simply about evidence translation. It is also about the nature and sufficiency of particular kinds of evidence in oral health. Research cultures are sometimes arguably more focussed on generalizable measures of significance to do with disease and risk factors rather than local healthcare systems and communities. Therefore, it is possible that differences between research and policy would have most likely been even larger if provincial or state policy documents were the focus of the study. The present research reflects the fact that the specialty area of dental public health, which is more likely to focus on policy-relevant concepts such as access, systems delivery and community perspectives, is a small and sometimes marginalized area within dentistry. Therefore, the study is potentially useful to those who wish to call for a greater emphasis on dental public health, including professional and consumer associations acting as policy advocates.

The debate about the policy relevance of research is ultimately about values. No claim is made here that there should be a perfect alignment of research and oral health policy. Rather, the study raises the question of whether the divide should be as large as the indicative evidence here suggests. It is hoped that this study will contribute to deeper discussion in oral health about the extent to which research is serving the development of sound policy – one way in which research can contribute to solutions for disadvantaged groups. If the results of the knowledge production system are not empirically measured – to demonstrate the extent to which policy and research are aligned – it is difficult for those who want to question such knowledge production systems to have any basis for doing so.

The notion of "policy persuasive research" may help frame these findings. It would appear from the results of this study that high-quality research does not always influence policy. While professional bodies may advocate for evidence-based research to be used in policy, this study suggests that little of this research actually becomes policy. The broader policy literature suggests many explanations for the research–policy disconnect in health – what is lacking is

empirical measurement of the divide, particularly in oral health. It is known that the research–policy divide in health has a complex causality (Nutley et al. 2007): policy making is aligned to political, financial and strategic imperatives (Corrigan and Watson 2003; Lavis et al. 2001); evidence does not always capture different stakeholder needs (Lavis et al. 2002); and many "real-world" local contextual limitations unaccounted-for by researchers apply to policy-making (Innvaer et al. 2002). Analysis of the literature explores debates about how quantitatively defined disciplines such as oral health too often fail to capture the complex contexts of policy, while qualitative research is perceived as lacking the defensible rigour required for the adversarial and warring interests found in policy contexts (Bell 2010; Bell and Seidel 2012).

Whatever the agreed-on cause, or however the values define the debate, this study has suggested that research in oral health and the development of oral health policies are two conversations happening in parallel. It provides some support for those wanting to make the two conversations coalesce and result in changes to oral health policy. Some public oral health debates have managed to achieve this single conversation, such as the water fluoridation debate. Oral health researchers might use results of the current study and the fluoridation example to develop strategies to make their research more policy-persuasive.

Finally, this study has suggested that machine and algorithm-based approaches can help measure language phenomena where anecdote and opinion about research translation have not worked so well to create a basis for change. There are around 1,000 published papers applying text analytics, computational linguistics or natural language processing in the health sciences, but none of these is a study of the research–policy divide. The corpus of policy research is vast, and deals extensively with the research–policy divide; however, to date, it has not used algorithm, machine-based language approaches such as Leximancer to help measure that divide, even indicatively. *The Lancet* has published an influential suite of papers on research waste arguing that 85% of medical research investment is wasted (Chalmers and Glasziou 2009); however, these papers focussed on research translation into practice, not policy (Chalmers et al. 2014). Results of the current study hopefully will contribute to informed debate about what kinds of methods can help evaluate the value to the community of its investment in research, particularly for the most vulnerable and disadvantaged, and especially in fields such as oral health where the problem of research translation has been so little treated.

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RESEARCH PAPER

Understanding the Research–Policy Divide for Oral Health Inequality

Comprendre le rôle des disparités entre recherche et politiques dans les inégalités en santé buccodentaire

ERICA BELL, LEONARD CROCOMBE, STEVEN CAMPBELL, LYNETTE R. GOLDBERG AND BASTIAN M. SEIDEL

Table 2. Instances of concepts in text blocks in oral health research abstracts versus concepts in oral health policy documents

Research abstracts			Policy documents		
Concept	**Count**	**Likelihood (%)**	**Concept**	**Count**	**Likelihood (%)**
Dentistry*	334,265	100	Health	3,274	100
Clinical	77,648	23	Dental*	1,487	45
Periodontology	71,317	21	Service	1,054	32%
Endodontically	54,375	16	Care*	816	25
Restorative	49,106	15	People**	615	19
Patients**	48,045	14	Promotion**	522	16
Materials	47,028	14	Public	465	14
Significantly	46,474	14	Diseases*	463	14
Autogenous	44,489	13	Access	407	12
Orthodontics	41,103	12	Children*	404	12
Implant	39,318	12	Community*	388	12
Hospital	37,194	11	Needs	362	11
Canals	31,952	10	Plan	319	10
Clearfil	30,469	9	Dentists	316	10
Maxillofacial	30,125	9	Population	312	10
Care*	29,261	9	Strategy	293	9
Disease*	26,631	8	Age*	267	8
Cells	25,714	8	Adults	257	8
Tested	24,795	7	Risk***	244	7
Resin	24,312	7	Practice	239	7
Prosthodontics	23,804	7	Treatment	225	7

Research abstracts			Policy documents		
Concept	**Count**	**Likelihood (%)**	**Concept**	**Count**	**Likelihood (%)**
Caries	23,660	7	School	221	7
Age*	21,813	7	Social	220	7
Children*	21,649	6	Training	206	6
Connective	21,550	6	Research	182	6
Tubules	20,222	6	System***	166	5
Maxillary	20,166	6	Survey	163	5
Enamel	20,135	6	Decayed	161	5
Education	19,861	6	Department	160	5
Factor	19,821	6	Cancer	109	3
Gingival	18,945	6	Torres Strait Islander	103	3
Mandibular	18,687	6	Aboriginal	102	3
Human	16,966	5	Data	90	3
Risk***	16,784	5			
Preventive**	15,854	5			
Specimens	14,532	4			
Model	14,318	4			
Lesion	12,714	4			
Biology	12,336	4			
Engineering	12,288	4			
Technique	12,125	4			
Systemically***	11,158	3			
Community*	11,110	3			
Pediatric	10,835	3			
Acid	9,679	3			
Therapies	9,360	3			
Molecular	7,971	2			
Pathology	7,813	2			
Biomedical	7,356	2			
Species	6,903	2			
Laboratory	6,693	2			
Genes	6,625	2			

Research abstracts			Policy documents		
Concept	**Count**	**Likelihood (%)**	**Concept**	**Count**	**Likelihood (%)**
Technology	6,457	2			
Syndrome	5,240	2			
Mechanism	5,161	2			
Total instances = 1,604,212			**Total instances = 14,612**		

Note: Plain text = concept words that do not match and are most unlikely to have the same or similar meaning.
*Concept words that match (in whole or part of case) and have the same or similar meaning >66% of the time.
**Concept words that are different but the meaning is the same or very similar >66% of the time.
***Concept words that match (in whole or part of case) but substantive meaning is different >66% of the time.