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Special issue: Policy-relevant population health research

Policy-relevant population health research: new approaches and opportunities

GUEST EDITORS

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The use of evidence from research in the development and evaluation of health policy and practice has the potential to improve both health outcomes and resource allocation. The potential value of evidence from research in health policy has been recognised by the New South Wales (NSW) Government in the State Health Plan[1] which promised to:

> *Build national and international research collaborations, to speed the transfer of the best research evidence from across the world to drive health policy and practice in NSW.*

At the national level, recent work has emphasised the need for an evidence-based approach to public policy and has suggested ways to build and utilise an effective evidence base.[2–4] Leaders of governments in the United States,[5] the United Kingdom (UK)[6,7] and Australia[8] support the increased use of evidence in policy. The 58th session of the World Health Assembly acknowledged the importance of this issue in passing a resolution requesting the Director-General of the World Health Organization (WHO) to:

> *…assist in the development of more effective mechanisms to bridge the divide between ways in which knowledge is generated and ways in which it is used, including the transformation of health research findings into policy and practice.*[9,10]

While the benefits are agreed, opportunities to use existing research to inform policy and practice and to generate new and useful information are often missed. In his review of the Medical Research Council in the UK, Cooksey[11] noted that:

> *The UK is at risk of failing to reap the full economic, health and social benefits that the UK's public investment in health research should generate…The Review identified cultural, institutional, and financial barriers to translating research into practice.*

Similarly in Australia the 1998 Health and Medical Research Review, the Virtuous Cycle (known as the Wills Review), emphasised the need for 'priority-driven research that contributes directly to population health and evidence-based health care', particularly the need to routinely integrate research-based knowledge into health policy and practice.[12] This message was restated in the subsequent review, Sustaining the Virtuous Cycle, chaired by John Grant (2004). The report noted the need for a greater focus on strategic research and the development of the infrastructure needed to enable the transfer of research results into policy and practice.[13]

Challenges and opportunities

How can we increase the use of evidence from research in health decision making? Over the past 10 years there has been an explosion of interest in grappling with this issue. For research to make an optimal impact on policy, better use should be made of existing evidence from research by improving the access of policy makers to research findings. Equally important is the generation of new research findings that are more relevant and useful to policy makers in Australia – in turn, this will require greater research capacity, research expertise and tools and infrastructure. There is a growing literature about the barriers to using evidence in policy and a wealth of different models to bring policy and research closer together that are being implemented both in Australia and internationally. However, a recent

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review by Moore et al[14] found only five studies that had attempted to evaluate the impact of strategies to increase the use of evidence from research in health policy or practice.

In the next 10 years, the development of a more strategic approach will be critical; this will require a shared understanding of different strategies, more explicit testing of what works and what doesn't, and a more careful selection of the best approaches for support by government.

Innovative approaches

This issue of the *NSW Public Health Bulletin* aims to contribute to the development of a shared understanding by describing some of the current innovative approaches to generating relevant research and increasing the use of evidence from research, particularly in NSW. The issue focuses on population health research (i.e. research relevant to the health status of groups or whole populations), though some authors in this issue and in the broader literature use the term 'public health research' to refer to this body of work.

Space has required us to be selective and there are many other interesting strategies – we note, for example, the Policy Liaison Initiative, a partnership between the Australasian Cochrane Collaboration and the Commonwealth Department of Health and Ageing designed to increase the use of systematic reviews and the forums conducted by the Menzies Centre for Health Policy to stimulate debate. Other examples in NSW are the Sax Institute's Evidence Check Program and the Centre for Informing Policy in Health with Evidence from Research (CIPHER). Evidence Check helps policy makers commission rapid reviews of research – over 70 reviews have been commissioned through the program and an evaluation has been undertaken.[15] CIPHER is a new National Health and Medical Research Council Centre of Research Excellence that will develop and test interventions to increase the use of evidence in policy and build methods for evaluating these interventions.

In this context, NSW Health's development of a population health research strategy is timely. The paper by Biggs and Stickney outlines the development of this strategy and its three main themes: the generation of high quality, relevant, population health research; maximising the use of population health research evidence; and building our capability for population health research. The paper illustrates how a review of strategic documents from other jurisdictions and countries, and consultations with key stakeholders, were used to design a set of actions to assist the Population Health Division of the NSW Department of Health to use more efficiently funds currently devoted to supporting research. A snapshot of the resulting actions highlights the importance of communication and collaboration.

The issue includes initiatives that receive either direct or indirect infrastructure support from NSW Health. Three case studies of different approaches to generating evidence that is more relevant to policy and programs, and which use this infrastructure funding, are highlighted. The paper by Milat et al demonstrates the value of a long term relationship between government and researchers which is focused on areas of mutual interest (the Physical Activity, Nutrition and Obesity Research Group). Banks et al (the *45 and Up Study*) and Irvine and Taylor (the Centre for Health Record Linkage) describe ways in which large-scale data sets and data linkage infrastructure can be used to provide accurate and timely information for health policy decisions.

Two papers describe more integrated approaches to generating and using evidence from research. The paper by Ritter presents the Drug Policy Modelling Program and the use of computer modelling as a translational tool to bridge the divide between research and policy. This approach links three separate elements: generating new evidence based on policy priorities; translating evidence; and studying policy processes including the impact of media on illicit drug policy. The paper by Perkins et al provides an insight into the Australian Rural Health Research Collaboration which aims to build capacity to foster high quality research and its use in programs for the benefit of remote and rural communities in NSW. This collaboration demonstrates the value of bringing together small research units and working in partnership with local health services and state-level policy makers.

The final paper by Hawe et al outlines the development and future directions of the Population Health Intervention Research Initiative (PHIRIC) in Canada, an approach to building population health research capacity at the national level. The PHIRIC has used a collaborative model: harnessing the energy, ideas and resources of key research funders, non-government organisations, policy makers and researchers across Canada. Through strategic, system-level changes, efforts are being realigned from the description of health problems to the identification and embedding of successful population health interventions.

The approaches illustrated in this issue describe existing examples of the better use of research in policy and generating research with policy relevance. However, more can be done to build a comprehensive understanding of effective methods of research translation. Initiatives such as NSW Health's Population Health Research Strategy and the CIPHER project will help to build this understanding, to improve population health outcomes.

References

1. NSW Government. A new direction for NSW: State Health Plan, towards 2010. Sydney: NSW Department of Health; February 2007. Available from: http://www.health.nsw.gov.au/pubs/2007/pdf/state_health_plan.pdf (Cited 4 March 2011.)
2. Banks G. Challenges of Evidence-Based Policy-Making. Australian Government Productivity Commission.

Canberra: Commonwealth of Australia; 2009. Available from: http://www.apsc.gov.au/publications09/evidencebasedpolicy.pdf (Cited 4 March 2011.)

3. Productivity Commission. Strengthening Evidence-Based Policy in the Australian Federation, Volume 1: Proceedings, Roundtable Proceedings. Canberra: Productivity Commission; 2010.
4. Productivity Commission. Strengthening Evidence-Based Policy in the Australian Federation, Volume 2: Background Paper. Canberra: Productivity Commission; 2010.
5. Mecklin J. The Science of Good Government. Miller-McCune Magazine, 22 June 2009. Available from: http://www.miller-mccune.com//politics/the-science-of-good-government-1284 (Cited 14 July 2009.)
6. Cabinet Office. Modernising Government. White Paper. London: Cabinet Office; 1999. Available from: http://www.archive.official-documents.co.uk/document/cm43/4310/4310.htm (Cited 27 July 2009.)
7. Cabinet Office (Strategic Policy Making Team). Professional Policy Making for the Twenty-First Century. London: Cabinet Office; 1999. Available from: http://archive.cabinetoffice.gov.uk/moderngov/policy/index.htm (Cited 27 July 2009.)
8. Rudd K. Address to Heads of Agencies and Members of Senior Executive Service. Canberra: Commonwealth of Australia; 2008.
9. World Health Assembly. Resolution on Health Research. 2005. Available from: http://www.who.int/rpc/meetings/58th_WHA_resolution.pdf (Cited 8 March 2011.)
10. Oxman AD, Bjorndal A, Becerra-Posada F, Gibson M, Block MA, Haines A et al. A framework for mandatory impact evaluation to ensure well informed public policy decisions. *Lancet* 2010; 375(9712): 427–31. doi:10.1016/S0140-6736(09)61251-4
11. Cooksey D. A Review of UK Health Research Funding. London: HMSO; 2006.
12. Wills P. The Virtuous Cycle — Working Together for Health and Medical Research. Health and Medical Research Strategic Review. Canberra: Commonwealth of Australia; 1998.
13. Grant J. Sustaining the Virtuous Cycle for a Healthy, Competitive Australia. Investment Review of Health and Medical Research. Canberra: Commonwealth of Australia; 2004
14. Moore G, Todd A, Redman S. Strategies to increase the use of evidence from research in population health policy and programs: a rapid review. November 2009. Available from the Centre for Epidemiology and Research, NSW Department of Health.
15. Campbell D, Donald B, Moore G, Frew D. Evidence check: knowledge brokering to commission research reviews for policy. *Evidence and Policy* 2011; 7(1): 97–107. doi:10.1332/174426411X553034

Developing a strategy to promote the generation and effective use of population health research for NSW Health: 2011–2015

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Abstract: The Population Health Division of the NSW Department of Health has developed a 5-year strategy to improve the effectiveness of its resource investment in population health research. This paper describes the development of the strategy, *Promoting the generation and effective use of population health research in NSW: a Strategy for NSW Health 2011–2015*. A review of Australian and international strategic research documents and stakeholder interviews was conducted to support the development of the strategy. The findings from these two processes influenced the structure of the document and supported the inclusion of strategies and actions to assist with identifying research priorities, improving communication, enhancing networks and partnerships, supporting workforce development initiatives, providing research infrastructure, enhancing research and the use of research evidence and streamlining research governance and ethics processes. Small group discussions and a detailed review of literature were conducted to refine the thinking around four of the more complex aspects of the strategy. Finally, a broad consultation process was used to test the face validity of the proposed strategy content.

The value of using evidence to inform health policy and practice is widely acknowledged.[1,2] A number of models have been developed; these processes are complex and evaluations of strategies to increase the use of evidence in policies and programs are rare.[3,4]

NSW Health invests in population health research through both the Population Health Division of the New South Wales (NSW) Department of Health and local population health services. The Population Health Division has recently developed a strategy which outlines how it will facilitate the conduct of high-quality, relevant, population health research and the use of research evidence in policy and practice in NSW Health. This paper describes how this strategy, *Promoting the generation and effective use of population health research in NSW: a Strategy for NSW Health 2011–2015* (the Strategy), was developed.

Methods

An Advisory Committee, comprising senior population health managers from the NSW Department of Health and local health services, academics in population health from NSW universities and senior managers from relevant non-government organisations, was established to provide guidance on the development and content of the Strategy.

To inform development three projects were undertaken: (1) a review of strategic documents that support decision-making for health research; (2) a series of stakeholder interviews; and (3) a rapid review of the literature that examined strategies to increase the use of evidence from research in population health policy and programs. The first two projects, the review of strategic documents and the stakeholder interviews, form the basis of this paper.[5,6] The findings from the rapid literature review have been reported elsewhere.[4] Three small-group discussions were held to refine complex aspects of the Strategy and, as a final step, the draft Strategy was circulated for broad consultation.

Review of strategic documents

A review of strategic health research documents was conducted by searching the websites of health departments of Australian states and territories and of other countries that have similar health care structures to Australia. Web searches were conducted using the search terms 'strategic directions', 'framework', 'plan', 'public health research', 'population health research' and 'health care research'. Documents were considered eligible for inclusion if they: were from comparable countries; related to public health, population health or health research; and were recent

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enough to be relevant to the NSW Strategy. Policy officers from the health departments of other jurisdictions were contacted to confirm whether they had a research plan and to ensure that current documents, including those from the grey literature, were included in the review.

Based on a preliminary analysis of the documents, an outline for the Strategy was prepared which covered advocacy for, the planning of, conducting, building capacity for, and using, population health research. The outline also proposed the inclusion of guidelines for researchers and users of research.

A detailed analysis of all the documents gathered was then conducted: their structure, content and terminology was summarised and systematically coded using the proposed headings in the Strategy outline. Additional themes not included in the outline were identified. The findings from this review, and input from the Advisory Committee, informed the second version of the Strategy outline that was used in the stakeholder interviews. This second Strategy outline also contained a draft vision, aim, objectives and key strategies.

Stakeholder interviews

A purposive selection process was used to include stakeholder groups in the interview process.[7] Twelve people were selected for individual interviews based upon their role (policy maker, health service manager or researcher, at state or local level). Three group interviews were held, two with NSW Department of Health managers and one with senior population health representatives from NSW universities. Ethical approval for all interviews was obtained through the University of New South Wales and all participants signed a consent form prior to interview.

Each interview took between 30 and 60 minutes. Information was collected using a combination of non-directive and standardised open-ended questions. Questions focused on participants' experience of conducting and using research, structures and strategies to support research and its use in population health, and gathering feedback on the Strategy outline.

Themes from the interviews were coded by two investigators based on the propositions in the Strategy outline.[7] Emerging themes and recurring patterns of interest were also identified and coded.[8] Iterative analysis was used; that is, the data were examined, coded and compared until saturation was reached. In consultation with the Advisory Committee, the results of the stakeholder interviews and the rapid review of strategies to increase the use of evidence from research in population health policy and programs[4] were used to develop a draft Strategy document, including a modified vision, aim, objectives and strategies, and with the inclusion of detailed actions to achieve the objectives.

Further group discussions were held to refine the sections on research priority setting, workforce development and fostering supportive organisational cultures.

Final consultation on the draft Strategy

The draft Strategy was circulated widely among a broad range of population health stakeholders in NSW (including those from the NSW Department of Health, local population health services, universities and non-government organisations) to confirm the face validity of the content of the Strategy. Limited modifications were made as a result of this final consultation.

Results

Review of strategic documents

The fifteen documents identified in the review had different formats: over half were strategies, five were plans, two were frameworks and one was a policy statement.[9–23] Although the terminology used differed, the strategies and plans shared similar structures and included specific actions to achieve identified goals and objectives. The strategies were longer-term (e.g. 5 years), higher-level and had substantial implementation budgets. The plans were more operational and covered shorter time periods. The frameworks were promotional in nature and the policy statement identified issues and methods of implementing solutions. Only one document included guidelines (for research funders).

Most of the actions within the documents reflected the proposed content of the NSW Strategy. Similar themes included: identifying research priorities to focus research planning; workforce development and research infrastructure to build research capacity; and enhancing the use of research evidence in policy and practice through networks and partnerships. The approach to identifying research priorities varied from linking to state health priorities or prescribing priority research questions, to assessing priorities against set criteria and providing principles of effective priority setting. Additional themes included research leadership (not well elucidated in the documents), and research governance and ethics. None of the documents contained specific advocacy strategies.

Stakeholder interviews

Four major themes emerged from the analysis of the stakeholder interviews.

Theme 1 – Improving communication and sharing of information

A common issue was the need for improved communication about: research developments; funding opportunities; infrastructure assets and training opportunities. Communication across four dimensions was identified as

important: (1) from the NSW Department of Health to local health services, universities and external organisations; (2) between researchers; (3) between researchers and policy makers and practitioners; and (4) across the Centres in the Population Health Division.

Many participants referred to the value of formal networks for formulating and conducting research, seeking advice, offering encouragement, sharing and disseminating information, fostering collaborations, and identifying gaps in research.

Decision makers noted that time constraints precluded conducting comprehensive literature searches to inform policy or practice decisions. A facility that summarises and stores research findings in an easy-to-digest format was suggested. Reviews conducted by NSW Health-funded research centres were valued, but thought not to be widely known.

Increasing access to, and utilisation of, existing data sets was recommended to enhance a coordinated, cohesive approach to research within NSW.

Those external to the Department often heard about Departmental funding through informal networks. There was a general consensus that funding processes could be more consistent and transparent and that potential synergies between Centres in the Population Health Division regarding funding procedures should be explored.

Theme 2 – Developing partnerships

Strengthening partnerships was seen as an important element of the NSW Strategy, underpinning many of the other strategies in the document. Long-term programmatic engagement between researchers and policy makers and practitioners was seen as essential to enhance the quality and relevance of population health research in NSW and for effective use of evidence in policy and practice. Partnerships supporting joint research projects between NSW Health and local universities were highlighted as beneficial and desirable, however, challenges to development of these partnerships were also raised.

Research partnerships were seen as a way for local health services to conduct larger research projects, thus ensuring sufficient size, power and effect, and to provide support for less experienced researchers. Partnerships were also perceived to foster common understanding between NSW Health, affiliated organisations and local universities.

Theme 3 – Workforce development

Support and encouragement for conducting population health research varied considerably across NSW Health. Practitioners said they often had to conduct research alongside their full-time 'day-to-day activities' and felt that research should be legitimised as part of the work of the Population Health Division and local population health services. The need for supportive policy and practice environments that value and use research evidence was emphasised.

Capacity building for several key groups in NSW was identified as important to improve population health research and its use, for example: NSW Health researchers at the state and local level require technical skills such as in mixed and complex research methods, biostatistics and epidemiology; policy makers and the population health workforce require broad research literacy to be able to use research evidence and consider appropriate evaluation techniques; and university researchers require support to undertake policy relevant research. Building collaborations with local universities and promoting opportunities to be involved in larger projects were identified as strategies for developing research skills.

Fellowships and scholarships were identified as valuable, cost-effective ways to: increase researcher capacity; strengthen links between NSW Health and universities; foster relevant research; and build the capacity of organisations to secure research funds. Mentorship for skills development and confidence building was not raised explicitly, but was implied through comments such as needing 'support from other staff' and 'someone to go to'.

Theme 4 – Enhancing research and the use of research evidence

Population health research priorities were seen as an essential component of the Strategy to enhance the relevance of research and the use of research evidence. As research priorities will change over time, participants recommended the establishment of processes for identifying, updating and communicating priorities for NSW Health, rather than specifying priorities in the document.

Simplifying ethics procedures, particularly for low and negligible risk projects, was cited as a way to streamline research processes. Guidance on research governance was also sought, particularly in relation to accessing datasets and developing research partnerships.

Using knowledge brokers and establishing long-term, project-based relationships were acknowledged as approaches for bringing researchers, policy makers and practitioners together and assisting with processes of exchange and knowledge co-creation to support the use of research evidence in practice.

Comments from the final consultation and small group discussions of complex issues informed the final version of the Strategy document, summarised in Figure 1 and Table 1.

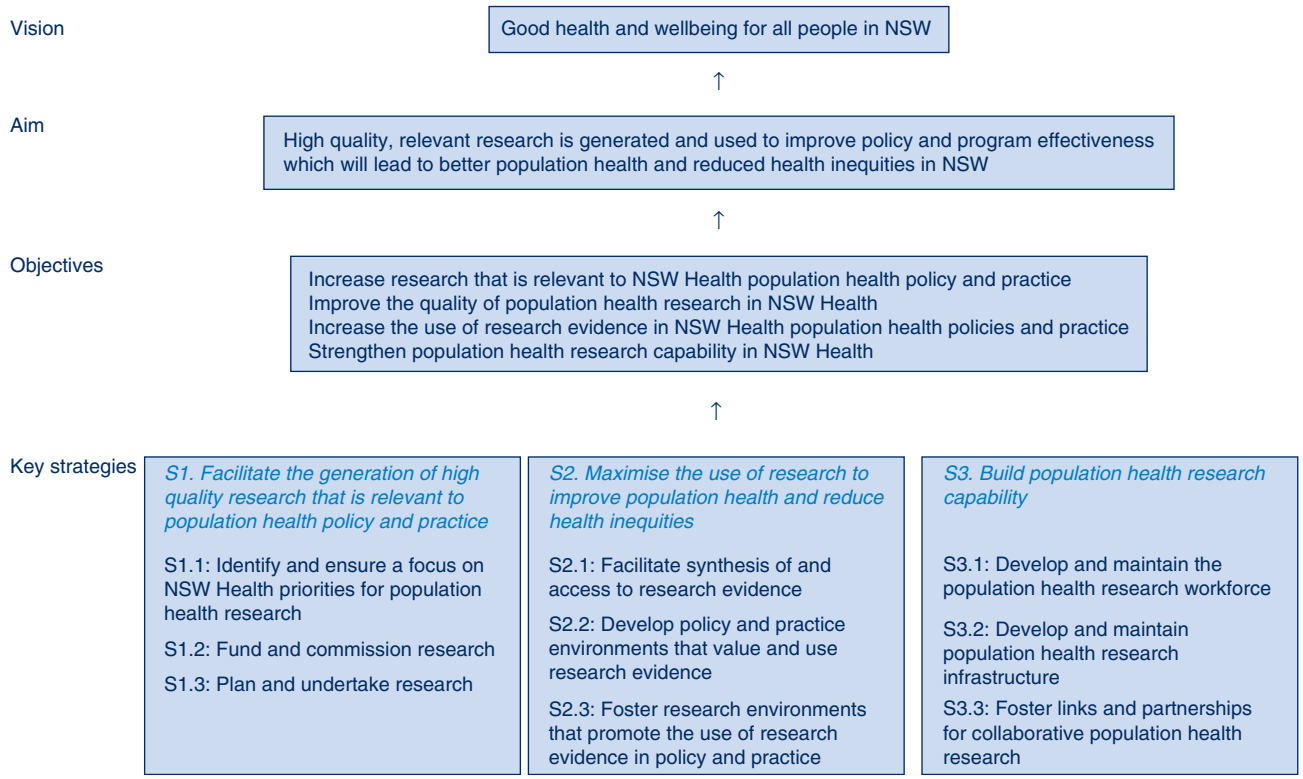

Figure 1. The Population Health Research Strategy framework.

Discussion

The review of strategic documents and stakeholder interviews contributed to shaping the structure and content of the NSW Strategy. The review confirmed that structuring the document as a longer-term strategy with specific actions was appropriate.

Encouragingly, the review endorsed the suggested content and focus of the Strategy, however some modifications were indicated. In the reviewed documents guidelines for research were rare, so for brevity a decision was made to remove guidelines from the NSW Strategy. Research governance and ethics, a common inclusion in the documents, was added to the Strategy while advocacy was removed as a separate action. Further, the review elucidated the multiple approaches used in other jurisdictions for identifying population health research priorities.

The stakeholder interviews were used to test the proposed content of the Strategy, a process recommended by Bridgeman and Davis (2004).[24] In particular, the importance of improved communication and information sharing was highlighted and is supported in the literature.[4,25,26] Actions have been included in the Strategy to keep researchers, policy makers and practitioners informed of: population health research priorities; research funding opportunities; funded research and its use in policy and practice; research syntheses; networks and training opportunities; data sets; infrastructure assets; and emerging research developments from within the Population Health Division.

Stakeholders frequently referred to the benefits of partnerships for research and the use of research evidence, a common theme in reviews of health research.[27–29] Partnerships were seen to reduce the tendency for services to work in silos, particularly important during a period of health service reform.[30] Essential to many other strategies, partnerships were seen to have the strongest connection with building research capability. The Strategy therefore places partnerships within the capability-building frame and focuses on improving researcher–practitioner links, particularly with universities. Effective partnerships are also key inputs and outcomes of many of the other actions in the document.

Underpinning capability for research was an expressed need to legitimise research as a core function of state and local population health services, initially described as a deficit in *NSW Research: Prescription for Health*.[29] The Strategy itself will be an initial driver for raising the profile and importance of research in population health services and specific actions have been included to foster environments that support the generation and use of research.

In relation to setting research priorities for population health, the Strategy adopted the approach favoured by

Table 1. Strategies and actions at a glance++

S1. Facilitate the generation of high quality research that is relevant to population health policy and practice	S2. Maximise the use of research to improve population health and reduce health inequities	S3. Build population health research capability
S1.1: Identify and ensure a focus on NSW Health priorities for population health research Establish and facilitate a process for identifying and updating population health research priorities for NSW Health Ensure that research funded and conducted by the PHD is aligned to identified NSW Health population health research priorities Ensure that identified population health research priorities are communicated to senior levels within the NSW Government Publish current NSW Health population health research priorities on the NSW DoH Research website	**S2.1: Facilitate synthesis of and access to research evidence** Develop a statement on publication of population health research funded or conducted by the PHD Consider mechanisms for the provision of editorial and publications assistance for PHD Centres Ensure that the use of existing NSW Health population health datasets promotes equity Establish mechanisms to ensure ready access to research findings and research syntheses	**S3.1: Develop and maintain the population health research workforce** Continue to administer current NSW Health training programs: the Biostatistical and Public Health Officer Training Programs* Establish the Aboriginal Population Health Training Initiative Establish a NSW Health population health research fellowship program Facilitate access for NSW Health staff to research training opportunities offered through external organisations Include local research personnel in research and evaluations relating to NSW Health statewide population health programs Support workforce development opportunities* Improve communication among NSW Health population health networks regarding research training opportunities Improve the use of technologies to ensure equity of access to research training opportunities
S1.2: Fund and commission research Ensure the use of evidence, evaluation and monitoring in relevant NSW DoH population health policies and programs Maintain the NSW DoH Population Health Research Group* Publish an outline of research funding opportunities available through the PHD on the NSW DoH Research website	**S2.2: Develop policy and practice environments that value and use research evidence** Encourage an organisational culture that supports the use of research evidence in policy and practice Develop a module on using research evidence in policy and practice for NSW DoH staff training programs Encourage and assist PHD Centres to establish knowledge broker functions within funded research centres Investigate the establishment of research indicators in the performance agreements of PHD Centre Directors and Directors of Population Health at the local level Strengthen researcher-practitioner engagement*	**S3.2: Develop and maintain population health research infrastructure** Continue to fund and periodically review current infrastructure programs and initiatives* Publish an outline of the major datasets held by the DoH on the NSW DoH Research website Publish an outline of the major infrastructure assets supported by the PHD on the NSW DoH Research website Publish a description of the work focus of PHD-funded organisations on the NSW DoH Research website
S1.3: Plan and undertake research Undertake priority research projects across the PHD and local population health services Support the implementation of the Research Governance Framework for NSW Health* Support the implementation of policies and procedures for ethical review and site authorisation of low and negligible risk research* Develop and implement a surveillance strategy Publish a list of population health research projects funded or conducted through the PHD on the NSW DoH Research website	**S2.3: Foster research environments that promote the use of research evidence in policy and practice** Ensure that all research funded and conducted through the PHD includes strategies for use of the research in policy and practice Encourage PHD-funded research centres to engage with policy makers and practitioners Include instances of use of research in policy and practice in the listing of PHD research projects on the NSW DoH Research website	**S3.3: Foster links and partnerships for collaborative population health research** Conduct negotiations with relevant universities regarding issues around population health research funding and partnerships Encourage collaboration with external organisations on NHMRC Partnership Grants, ARC Linkage Grants and other grant opportunities Strengthen collaboration and partnerships with those who are likely to be affected by research Continue to work with the Mental Health and Drug and Alcohol Office on preventive population health research initiatives* Hold a biennial research showcase Publish an organisational chart for the PHD and roles of PHD Centres and Branches on the NSW DoH Research website Publish a list of official networks supported by the PHD on the NSW DoH Research website Promote the NSW DoH Research website and relevant NSW population health research initiatives

++Actions to improve communication regarding population health research within NSW Health and with relevant agencies external to NSW Health form a large part of the program of work described in this Strategy. These actions are shaded in blue.
*Indicates actions which are currently underway.
PHD: Population Health Division of the NSW Department of Health.
DoH: Department of Health.
NHMRC: National Health and Medical Research Council.
ARC: Australian Research Council.

stakeholders, that is, the establishment of a process for identification and dissemination of priorities.

Most of the other actions raised in the interviews have been incorporated into the Strategy and many of these are supported in the literature. For example, the value of knowledge brokerage services,[31] success of fellowship programs in other jurisdictions,[5] enhancing the capacity of the existing research workforce through networks and improved access to training opportunities[26,32] and simplifying ethics procedures.[33]

The actions in the Strategy are designed to be implemented within existing NSW Health funds, with a focus on managing current investment more strategically and working better with internal and external partners.

Conclusion

Review and stakeholder consultation processes used to formulate NSW Health's *Promoting the generation and effective use of population health research in NSW: a Strategy for NSW Health 2011–2015* refined ideas for actions to improve the generation and use of population health research within current budget allocations. These processes strengthened the relevance and comprehensiveness of the Strategy. The Population Health Division will facilitate implementation of the Strategy and report on progress and outcomes.

Promoting the generation and effective use of population health research in NSW: a strategy for NSW Health 2011–2015 is available from: http://www.health.nsw.gov.au/resources

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References

1. Banks G. Challenges of Evidence-Based Policy-Making. Australian Government Productivity Commission. Canberra: Commonwealth of Australia; 2009. Available from: http://www.apsc.gov.au/publications09/evidencebasedpolicy.pdf (Cited 4 March 2011.)
2. Productivity Commission. Strengthening Evidence-based Policy in the Australian Federation, Volume 2: Background Paper. Canberra: Productivity Commission; 2010.
3. Kitson A, Rycroft-Malone J, Harvey G, McCormack B, Seers K, Titchen A. Evaluating the successful implementation of evidence into practice using the PARiHS framework: theoretical and practical challenges. *Implement Sci* 2008; 3: 1. doi:10.1186/1748-5908-3-1
4. Moore G, Todd A, Redman S. Strategies to increase the use of evidence from research in population health policy and programs: a rapid review. November 2009. Available from the Centre for Epidemiology and Research, NSW Department of Health.
5. Biggs J. A review of strategic documents that support decision-making for population health research. February 2010. Available on request from the Centre for Epidemiology and Research, NSW Department of Health.
6. Biggs J. The results of stakeholder consultations to inform the development of the Strategic Directions for Population Health Research. March 2010. Available on request from the Centre for Epidemiology and Research, NSW Department of Health.
7. Patton MQ. Qualitative research and evaluation methods. 3rd ed. Thousand Oaks, CA: Sage Publications; 2002.
8. Burnard P. A method of analysing interview transcripts in qualitative research. *Nurse Educ Today* 1991; 11(6): 461–6. doi:10.1016/0260-6917(91)90009-Y
9. Canadian Institutes of Health Research. Health Research Roadmap: Creating innovative research for better health and health care: 2009/10–2013/14; 2009.
10. Government of South Australia, Department of Human Services. Research and Evaluation Framework: 2002–2005.
11. Government of South Australia, Department of Health. Strategic health research program. Research priorities: general health topics; 2007–2008.
12. Government of South Australia, Department of Health. Strategic health research program. Research priorities: health systems research; 2007–2008.
13. Health Protection Agency. Providing the Evidence Base for Public Health: The Health Protection Agency's Research Strategy 2005–10; 2005.
14. Health Research Council of New Zealand. HRC Strategic Plan 2008–2013; 2008.
15. NHS Department of Health, Research and Development Directorate. Best Research for Best Health: A new national health research strategy – the NHS contribution to health research in England; 2006.
16. NHS Department of Health. A Research and Development Strategy for Public Health; 2001.
17. Queensland Health. Queensland Health's Research and Development Plan; 2007–2010.
18. Queensland Health. Research for a healthier future: 2020. Health and Medical Research and Development Strategy; 2009.
19. Saskatchewan Health. Healthy People. A Healthy Province; 2004.
20. Scottish Executive. Prevention/Wellness: Research strategy for Health and Healthcare; 2003.
21. Victorian Government, Department of Human Services. Public Health Research Policy Statement: New knowledge for improved health; 2005.
22. Victorian Health Promotion Foundation. Lead, empower, support, connect. Victorian Health Promotion Foundation: Strategic Priorities; 2006–2009.
23. Welsh Assembly Government, Wales Office of Research and Development for Health and Social Care. A Health and Social Care Research and Development Strategic Framework for Wales: a consultation document; 2002.

24. Bridgeman P, Davis G. The Australian Policy Handbook. 3rd ed. Sydney: Allen and Unwin; 2004.

25. Straus S, Haynes RB. Managing evidence-based knowledge: the need for reliable, relevant and readable resources. *CMAJ* 2009; 180(9): 942–5. doi:10.1503/cmaj.081697

26. Van Wave TW, Scrutchfield FD, Honoré PA. Recent Advances in Public Health Systems Research in the United States. *Annu Rev Public Health* 2010; 31: 283–95. doi:10.1146/annurev.publhealth.012809.103550

27. National Health and Medical Research Council. Report of the Review of Public Health Research Funding in Australia, December 2008. Canberra: Commonwealth of Australia; 2009.

28. National Health and Hospitals Reform Commission. Beyond the Blame Game: Accountability and performance benchmarks for the next Australian Health Care Agreements. Canberra: NHHRC; 2008.

29. NSW Government. NSW Research: a Prescription for Health. Report of a review commissioned by the Minister for Science and Medical Research, the Hon Frank Sartor MP. Sydney: NSW Government; 2004.

30. Australian Government. A National Health and Hospitals Network for Australia's Future. Australian Government; 2010.

31. Redman S, Jorm L, Haines M. Increasing the use of research in health policy: the Sax Institute model. *Australasian Epidemiologist* 2008; 15(3): 15–8.

32. Madden L, Salmon A. Public health workforce: results of a NSW statewide consultation on the development of the national public health workforce. *N S W Public Health Bull* 1999; 10(3): 19–21. doi:10.1071/NB99009

33. NSW Department of Health. Improving ethical review and site authorisation processes in NSW: Action Plan. Sydney: NSW Department of Health; 2009.

Fostering population health research in NSW: the role of research infrastructure

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Research infrastructure – the assets, facilities and services that support research and maintain the capacity of researchers to undertake research – is an important contributor to research excellence.[1] A key theme in the 2008 review of public health research funding in Australia was the need for strategic investment in public health research infrastructure, including centres of research excellence, large scale assets such as cohort studies, disease registers, data linkage and survey facilities, and the career development of researchers.[2]

Several infrastructure funding programs at the federal and state government level provide research organisations with resources to help meet indirect costs that are not met by research grants. There is also a move towards more strategic investment in research infrastructure, for example the National Collaborative Research Infrastructure Strategy.[1] Such investments, which are often collaborative, are designed to create research assets, promote data access for a wide range of researchers and avoid duplication of effort.

NSW Health provides support for population health research infrastructure.[3] Strategies include funding research organisations relevant to NSW population health priorities, population health surveys and statewide data collections, research capacity building programs and supporting other research assets (Table 1).

The infrastructure supported by NSW Health promotes the generation and use of population health research in several ways. For example:

- Research centres build the evidence base around New South Wales (NSW) priority areas and facilitate the adoption of research findings in policy and programs through the synthesis and dissemination of research findings and provision of advice in strategy development.
- The ongoing monitoring of population health and the establishment of research asset studies provide information about trends in health, health behaviours and attitudes.[4] Surveillance data and linked data sets can be made available to researchers, allowing cost-effective analyses on large population samples. The outputs of these analyses help to test hypotheses, identify population health issues and inform the evaluation of policies and programs.
- Capacity building strategies increase workforce skills in commissioning and undertaking research and in using research evidence in policy and practice.[3]

The following three case studies illustrate how infrastructure fosters better population health research in NSW. The first describes how the Physical Activity, Nutrition and Obesity Research Group, a NSW Health funded research centre, has increased the generation and use of policy-relevant research. The second and third case studies explain how the *45 and Up Study* and the Centre for Health Record Linkage encourage large scale, efficient and timely research. All three initiatives include a focus on developing links and partnerships between policy makers and researchers.

Research infrastructure contributes to the generation and use of high quality, policy-relevant research, leading to improved policy and program effectiveness, better population health and reduced health inequity. While NSW Health makes a significant investment in this area, increasing the impact of this investment (e.g. through fostering greater awareness of major research assets and how to use them and determining the best investment mix) remains an ongoing challenge. Increasing the impact of this investment is a major focus of work within NSW Health over the next 5 years.[3]

References

1. Department of Innovation. Industry and Science. Strategic Roadmap for Australian Research Infrastructure. Canberra: Australian Government; 2008.
2. National Health and Medical Research Council. Report of the Review of Public Health Research Funding in Australia, December 2008. Canberra: Commonwealth of Australia; 2009.
3. Centre for Epidemiology and Research. Promoting the generation and effective use of population health research in NSW: a Strategy for NSW Health 2011–2015. North Sydney: NSW Department of Health; 2010.
4. NSW Health. New South Wales School Students Health Behaviours Survey. Available from: http://www.health.nsw.gov.au/publichealth/surveys/hss/index.asp (Cited 30 December 2010.)

Table 1. Examples of NSW population health research infrastructure supported by the NSW Department of Health in 2010–11

Research organisations	Surveys, data collections and tools	Strategies to build research capacity	Other research infrastructure
• Sax Institute • Physical Activity, Nutrition and Obesity Research Group (PANORG), University of Sydney • Injury Prevention Research Centre, University of NSW • NSW Healthy Built Environments Program, University of NSW • National Centre in HIV Social Research, University of NSW • National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases, University of Sydney • National Centre in HIV Epidemiology and Clinical Research, University of NSW	*NSW Population Surveys* • NSW Population Health Survey Program • New South Wales School Students Health Behaviours Survey • Teen Dental Survey • 2010 NSW Schools Physical Activity and Nutrition Survey *Surveillance systems* • Public Health Real-time Emergency Department Surveillance System • Notifiable Conditions • Administrative data sets including: Admitted Patient Data Collection, Emergency Department Data Collection, Midwives Data Collection • Analytical tools including: Health Outcomes Information Statistical Toolkit, *Health Statistics NSW*, and the graphical online data surveillance and evaluation for notifiable diseases (GODSEND)	• Capacity Building Infrastructure Grants Program • NSW Public Health Officer Training Program and NSW Biostatistical Officer Training Program • *NSW Public Health Bulletin* • Health Promotion Demonstration Research Grants Scheme • NSW Workforce Development Program in Hepatitis, HIV and Sexual Health	• Centre for Health Record Linkage (CHeReL) • Population Health Research Network • National Coroners Survey • Australian School Students Alcohol and Drug Survey • Sydney Gay Community Periodic Survey • Aboriginal Sexually Transmitted Infections (STIs) and Blood-Borne Viruses (BBV) Survey • Australian Research Centre for Population Oral Health • *45 and Up Study* (study partner)

The Physical Activity, Nutrition and Obesity Research Group: fostering population health research in NSW

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The requirements of policy makers for contextually relevant evidence are increasingly documented and understood.[1,2] In response, there have been significant recent international and Australian initiatives to facilitate closer links between policy makers and researchers to address questions of policy relevance.[3–5] The gap between researchers and policy makers has been well described by Lomas, who noted that: '…*efforts by researchers and by decision makers seem to proceed largely independently. Both have their own (often misplaced) ideas about the other's environment. Opportunities for ongoing exchange and communication are few*…'.[6] One way to bridge this structural and communication gap is to develop formal collaborative mechanisms between researchers and policy makers, such as the establishment of university-based research centres.[7]

The role of the Physical Activity, Nutrition and Obesity Research Group as a university-based research centre

The New South Wales (NSW) Department of Health has arguably led the way in Australia with its commitment to funding university-based research groups to inform public health efforts across a range of issues including drug and alcohol, HIV/AIDS, injury prevention, immunisation, physical activity, nutrition and obesity prevention. The development of a body of policy-relevant research that is rapidly applied to policy and practice is particularly important for primary prevention of chronic disease, as there continues to be limited high quality and appropriate evidence of effective and sustainable interventions.[8] Over the past decade, this funding has, at different times, supported the NSW Centre for Overweight and Obesity, the NSW Centre for Physical Activity and Health, and the NSW Centre for Public Health Nutrition. A review of these centres in 2007 concluded that they had made important contributions to health behaviour surveillance, determinants and intervention research, and ultimately resulted in greater collaboration between policy makers and researchers.[9] The review also recommended the formation of a larger, single research group across these interconnected health issues with longer term funding.

After an open tender process in June 2008, the NSW Department of Health committed $4.4 million over 5 years to the School of Public Health at the University of Sydney to establish the Physical Activity, Nutrition and Obesity Research Group (PANORG). Similar to its predecessors, the work of PANORG is organised according to the following four key building blocks for generating and reviewing public health evidence:

- population monitoring
- determinants and environments
- intervention research
- measurement tools.

Illustrative examples of PANORG's work in these areas are outlined in Table 1.

In contrast to investigator-driven research groups, PANORG has clear arrangements for regular and frequent communication and exchange with policy makers, including:

- a specified program of policy-relevant research negotiated between the research group and funders
- two-way communication systems, with a mix of formal (e.g. quarterly reports) and informal exchanges
- a purposive, planned approach to the dissemination of research results and products to relevant end user groups.

This systematic and purposeful involvement of both parties in policy making and research development processes contributes to better population health research, ensuring that research projects are policy relevant and timely, whilst achieving excellent academic quality and publication in peer-reviewed journals. An example of purposeful collaborative involvement has been the development and implementation of the 2010 NSW Schools Physical Activity and Nutrition Survey, the fourth in Australia's longest running series of

Table 1. Examples of Physical Activity, Nutrition and Obesity Research Group research across key building blocks for evidence creation

Population monitoring	Determinants and environments	Intervention research	Measurement tools
NSW Schools Physical Activity and Nutrition Survey (SPANS) 2010 Secondary analyses of *NSW Health Population Health Survey and School Students Health Behaviours Survey*	Children's exposure to food marketing Associations between children's sedentary behaviours and fitness	Evaluation of Phase 1 of *NSW Munch and Move* Program in preschools *Good for Kids Good for Life* child obesity prevention program evaluation Collaboration with area health services on the *NSW Health Promotion Demonstration Research Grants Scheme*	*NSW Overweight and Obesity Monitoring Framework* An inventory of physical activity measurement tools for field workers Epidemiological work around streamlining physical activity surveillance tools for population monitoring

children's physical activity and nutrition surveys. The Department managed the stakeholder engagement that informed the development of the survey, while PANORG oversaw survey fieldwork, data analysis and reporting.

This collaboration also extends to PANORG regularly providing expert and technical advice to the Centre for Health Advancement at the NSW Department of Health regarding health issue priorities, strategic policy and program directions and evaluations. Another recent example was the provision of evidence and technical advice that has shaped the development of NSW Implementation Plans and Evaluation and Monitoring frameworks for the Council of Australian Governments' National Partnership Agreement on Preventative Health. This level of access was only possible due to the close and ongoing relationship between PANORG and the Department that is protected by mutually agreed contractual obligations. In addition, PANORG collaborates with local area health services' health promotion strategic planning and research and evaluation activities.

Conclusion

As a government funded university research group, PANORG plays an active role in bridging the gap between evidence, policy and practice in NSW in the areas of physical activity, nutrition and obesity prevention. Frequent communication and ongoing collaboration between policy makers and researchers contributes to better population health research outcomes in NSW.

Acknowledgments

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References

1. Campbell DM, Redman S, Jorm L, Cooke M, Zwi AB, Rychetnik L. Increasing the use of evidence in health policy: practice and views of policy makers and researchers. *Aust New Zealand Health Policy* 2009; 6: 21. doi:10.1186/1743-8462-6-21
2. Bowen S, Zwi A, Sainsbury P. What evidence informs government population health policy? Lessons from early childhood intervention policy in Australia. *N S W Public Health Bull* 2005; 16(11–12): 180–4.
3. National Health and Medical Research Council. *National Health and Medical Research Council Strategic Plan 2007–2009.* Canberra: NHMRC; 2007.
4. NSW Department of Health. NSW Health Promotion Demonstration Research Grants Scheme Funding Priorities. Available from: http://www.health.nsw.gov.au/publichealth/healthpromotion/grants/index.asp (Cited 24 May 2010.)
5. Canadian Institutes of Health Research. Health Research Roadmap: Creating innovative research for better health and health care CIHR Strategic Plan: 2009/10–2013/14. Ottawa: CIHR; 2009.
6. Lomas J. Research and evidence-based decision making. *Aust N Z J Public Health* 1997; 21: 439–41. doi:10.1111/j.1467-842X.1997.tb01730.x
7. Langille LL, Crowell SJ, Lyon REF. Six essential roles of health promotion research centres: the Atlantic Canada experience. *Health Promot Int* 2009; 24(1): 78–87. doi:10.1093/heapro/dap001
8. World Health Organization. Interventions on diet and physical activity: what works. Summary report. Geneva: WHO; 2009.
9. Scott J, Bowen S. Review of NSW Health funded: Centre for Overweight and Obesity (COO), Centre for Physical Activity (CPAH), and Centre for Public Health Nutrition (CPHN). Unpublished Report; 2007.

The *45 and Up Study*: fostering population health research in NSW

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Excellent, forward-looking population health research requires good ideas, skilled people and high quality infrastructure. The *45 and Up Study* was developed to enhance population health research in New South Wales (NSW).[1] Since its inception in 2003, it has grown to become the largest cohort study of its kind in the Southern Hemisphere, with more than 50 research projects underway using *45 and Up Study* data. It is a collaborative research resource managed by The Sax Institute in collaboration with major partner the Cancer Council NSW and partners: the National Heart Foundation of Australia (NSW Division); NSW Health; *beyondblue: the national depression initiative*; Ageing, Disability and Home Care, Department of Human Services NSW; and UnitingCare Ageing.

A shared large-scale data resource, with extensive data linkage

The *45 and Up Study* is a large-scale cohort study that includes 266 848 NSW men and women aged 45 years and over. From February 2006 to December 2009, participants sampled from the Medicare Australia enrolment database joined the study by completing a baseline questionnaire and giving signed consent for follow-up through repeat questionnaires and linkage of their data to multiple health-related databases,[1] including data on hospitalisations, cancer registrations, deaths, medications, primary health care and aged care. Researchers can also use the *45 and Up Study* as a framework for more detailed data collection and intervention studies, known as sub-studies. Following a period of exclusive use by study investigators, sub-study data are contributed to the central *45 and Up Study* pool of data.

At the time of writing, the *45 and Up Study* and linkage resources available to researchers consist of:

- baseline questionnaire data (questionnaires can be viewed at www.45andUp.org.au)
- linked data on health and service use
- sub-study data, as they become available.

Additional large-scale data will be added over time, including a 5-year follow-up questionnaire for the whole cohort, detailed data on social and economic factors requested from the first 100 000 participants, and enhanced data collection relating to diet.

Researchers apply to use the data from the study through the 45 and Up Study Coordinating Centre, supported by an independent Access Committee. Projects that are in the public interest, meet the appropriate scientific quality and feasibility standards, and have approval from relevant data custodians and human research ethics committees, are given access to data. The charges to research groups depend on the complexity and scale of each project and whether or not their institution has paid for an ongoing licence to access data from the *45 and Up Study*.

How does the *45 and Up Study* foster better population health research in NSW?

The *45 and Up Study* represents a pooling of resources to facilitate research. It fosters better population health research in NSW by:

- **Encouraging large-scale research.** Large-scale cohort studies provide prospective data on a wide range of exposures in relation to a wide range of outcomes and are recognised internationally as a sound basis for high quality research.
- **Reducing the need for primary data collection.** The *45 and Up Study* improves the efficiency and timeliness of research by allowing researchers to focus on data analysis, interpretation and writing up, rather than data collection and securing funding for data collection.
- **Improving the targeting of new data collection.** Researchers can use the *45 and Up Study* as a sampling frame for identifying participants with specific characteristics who can be recruited into sub-studies.
- **Providing a focus for collaboration.** The high profile of the study and its strong communication with a large network of collaborating researchers means that it acts as a focus for forming new research collaborations, and attracting new researchers from a wide range of disciplines.
- **Increasing the competitiveness of funding applications from NSW.** The study improves the competitiveness of grant applications from NSW, since they

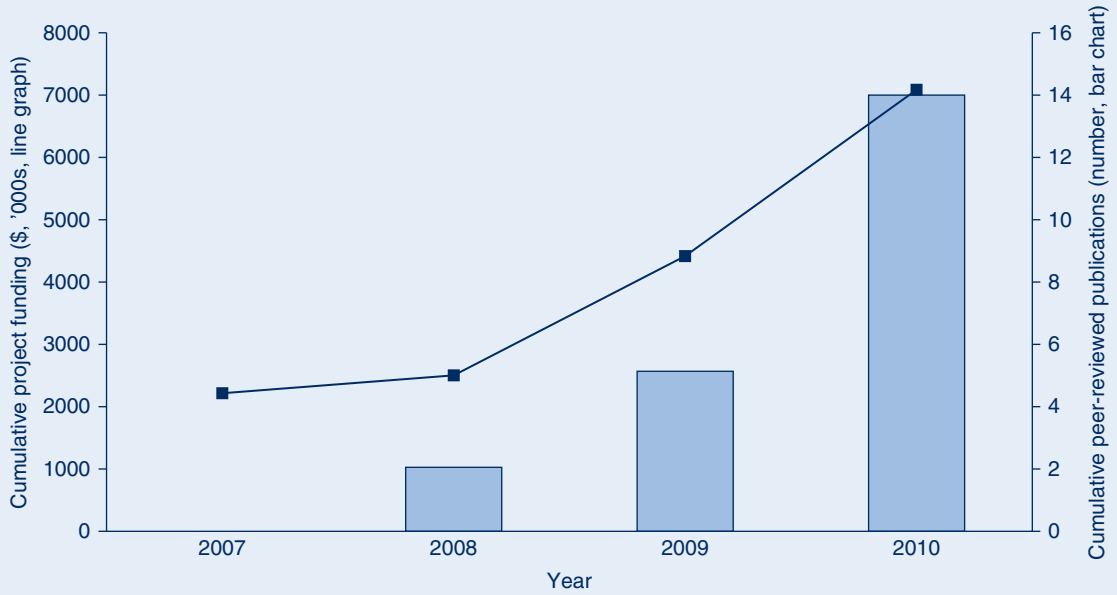

Figure 1. The *45 and Up Study*: cumulative funding for projects and peer-reviewed publications. Source: The Sax Institute, 2010.

can build on the existing infrastructure and can achieve more substantial outcomes more quickly and at reduced cost, compared to projects requiring extensive *de novo* data collection.

- **Providing data that is of direct relevance to health services provision and hence policy agencies.** The study has ongoing linkage to key health datasets through the Centre for Health Record Linkage, as well as the potential for ad hoc linkages to other service data. This presents opportunities for enhancing routinely collected health service data, and health services research, through the addition of rich person-specific information on key confounding and mediating factors such as socioeconomic status and risk behaviours.
- **Providing research infrastructure that is sustainable and grows in value over time.** The research value of the study will increase exponentially as additional events accrue and additional data are collected.

Research to date in the *45 and Up Study*

More than 70 projects have been approved to use *45 and Up Study* data and over 50 are underway, spanning a wide range of disciplines, health conditions and research groups (see www.45andUp.org.au for details). Seven sub-studies collecting additional data on participants are underway. At June 2010, the *45 and Up Study* had cost a total of around $7 million to establish and run. In addition to this, over $7 million in project-specific funding has been received to date for research using *45 and Up Study* data (Figure 1). Despite completion of data entry as recently as early 2010, a total of 14 peer-reviewed papers are either published or in press (Figure 1). These papers provide insights into: breast-feeding and diabetes; sleep and health; early retirement due to illness; cancer screening; and obesity.

Conclusion

The *45 and Up Study* provides infrastructure for a wide range of public health research projects in NSW. Many of these projects and collaborations would not have been possible in the absence of this large-scale infrastructure.

Reference

1. 45 and Up Study Collaborators. Cohort profile: the 45 and Up Study. *Int J Epidemiol* 2008; 37(5): 941–7. doi:10.1093/ije/dym184

The Centre for Health Record Linkage: fostering population health research in NSW

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The Centre for Health Record Linkage (CHeReL) was established in July 2006 with the mission:

> *To create and sustain a record linkage infrastructure for the health and human services sector, and provide access to these resources to bona fide researchers and health planners and policy makers.*

The benefits of researcher access to record linkage infrastructure are well recognised.[1,2] Linkage transforms data that are collected on a routine basis as part of health care into a powerful resource for research. Linked data can be used to investigate the safety and quality of health care, the effectiveness of prevention and screening programs, and the patterns, costs and outcomes of health care for people with specific conditions such as diabetes, cancer and heart failure. Linkage of health data with data from other agencies – such as education, aged care and community services – can be used for research in the social sciences and to study the broader outcomes of ill health and disability.

Use of the CHeReL's linkage services has increased steadily over time. To date more than 120 linkage projects using data from the health, education, human services, justice and transport sectors have been completed. These include:

- follow-up of cohorts of people with rare conditions or outcomes reported through population health datasets (e.g. infective endocarditis,[3] childhood cancer[4])
- morbidity and mortality associated with infectious diseases (e.g. Hepatitis C,[5] influenza)
- follow-up of researcher-supplied cohorts to obtain information on service utilisation or health-related outcomes (e.g. *45 and Up Study*,[6] the Australian Longitudinal Study on Women's Health and the Australian HIV Observational Database[7])
- case control studies of cancer screening behaviour and outcomes
- validation of the accuracy of screening tests by linkage with outcome information (e.g. antenatal serum screening and pregnancy outcomes[8])
- incidence of diseases and conditions by the identification of first-time events (e.g. first admissions for stroke and heart failure)
- reporting of outcomes of health care adjusted for co-morbidity using historically linked data (e.g. outcomes for stroke care in New South Wales (NSW) hospitals)
- studies of health care safety, utilisation and costs (e.g. adverse events in hospital, cancer patterns of care[9])
- validation studies of the accuracy of information held in population health datasets
- improved ascertainment of health information (e.g. Aboriginality, diagnoses) using multiple data sources.

Using probabilistic linkage software,[10] the CHeReL has created a Master Linkage Key of records from population health datasets commonly used by researchers (Table 1). The Master Linkage Key currently includes over 36 million records relating to about 8 million people. Large amounts of historical data can be accessed for research while avoiding the prohibitive cost and time of creating one-off links for individual projects or establishing *de novo* longitudinal studies. To the extent that these datasets provide coverage of complete populations the outputs of record linkage studies avoid some of the potential biases associated with unrepresentative or incomplete samples compared with traditional study designs.

The CHeReL also fosters high quality research by:

- participating in the Population Health Research Network[11] which has been established under the National Collaborative Research Infrastructure Strategy[12] to provide Australian researchers with access to linkable non-identified data from a diverse range of health datasets, across jurisdictions and sectors
- providing a formal introduction to the CHeReL's linkage methods in a short course on the analysis of linked data through the University of Sydney
- providing support for the NSW Health Data Linkage Special Interest Group, which meets 3–4 times per year
- providing advice to researchers on the design, feasibility, cost and process of linkage studies.

Robust data governance has been critical to the CHeReL's success. Data custodian approval and approval of a human research ethics committee is required for all research projects. The CHeReL also complies with best practice in privacy preserving record linkage, which involves the separation of the linkage of personally identifying information from the analysis of

Table 1. The Centre for Health Record Linkage Master Linkage Key, 30 November 2010

Data collection	Years	No. records
NSW Admitted Patient Data Collection	July 2000–June 2009	19 874 083
NSW Registry of Births, Deaths & Marriages Birth Registrations	1994–2008	1 333 539
NSW Registry of Births, Deaths & Marriages Death Registrations	Jan 1994–June 2010	802 739
Australian Bureau of Statistics Mortality Data (NSW)	1985–2007	1 020 798
Australian Bureau of Statistics Perinatal Mortality Data (NSW)	1994–2005	9445
NSW Midwives Data Collection (mothers)	1994–2008	1 331 115
NSW Midwives Data Collection (babies)	1994–2008	1 331 115
NSW Central Cancer Registry	1994–2008	504 894
Australian Capital Territory Cancer Registry	1994–2006	14 821
The *45 and Up Study*	2010 update	267 235
NSW Emergency Department Data Collection	2005–2009	9 526 946
NSW Notifiable Conditions Information Management System	1993–2008	421 870
NSW Perinatal Death Review Database	2000–2006	4657
Total		**36 443 257**

de-identified linked health records.[13] This approach to data governance has been strongly supported by organisations that are custodians of health records, human research ethics committees, and the community. By providing a mechanism for researchers to access non-identified linked data, the CHeReL enables ethically approved research in the public interest to be carried out without consent, minimising bias and allowing researchers to access data on whole populations.

Conclusion

The CHeReL has become core infrastructure for health and health services research in NSW. Further information on the CHeReL is available from: www.cherel.org.au.

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References

1. Roos LL, Menec V, Currie RJ. Policy analysis in an information-rich environment. *Soc Sci Med* 2004; 58(11): 2231–41. doi:10.1016/j.socscimed.2003.08.008
2. Holman CDJ, Bass AJ, Rosman DL, Smith MB, Semmens JB, Glasson EJ et al. A decade of data linkage in Western Australia: strategic design, applications and benefits of the WA data linkage system. *Aust Health Rev* 2008; 32(4): 766–77. doi:10.1071/AH080766
3. Sy RW, Kritharides L. Health care exposure and age in infective endocarditis: results of a contemporary population-based profile of 1,536 patients in Australia. *Eur Heart J* 2010; 31(15): 1890–7. doi:10.1093/eurheartj/ehq110
4. Stavrou EP, Baker DF, Bishop JF. Maternal smoking during pregnancy and childhood cancer in New South Wales: a record linkage investigation. *Cancer Causes Control* 2009; 20(9): 1551–8. doi:10.1007/s10552-009-9400-5
5. Gidding H, Amin J, Dore GJ, Ward K, Law M. Hospital related morbidity in people first notified with Hepatitis C: a population-based record linkage study in New South Wales, Australia. *J Hepatol* 2010; 53(1): 43–9. doi:10.1016/j.jhep.2010.01.036
6. Jorm LR, Walter SR, Lujic S, Byles JE, Kendig HL. Home and community care services. A major opportunity for preventive health care. *BMC Geriatr* 2010; 10: 26. doi:10.1186/1471-2318-10-26
7. Falster K, Wand H, Donovan B, Anderson J, Nolan D, Watson K et al. Hospitalisations in a cohort of HIV patients in Australia, 1999-2007. *AIDS* 2010; 24(9): 1329–39. doi:10.1097/QAD.0b013e328339e245
8. Lain SJ, Algert CS, Tasevski V, Morris JM, Roberts CL. Record linkage to obtain birth outcomes for the evaluation of screening biomarkers in pregnancy: a feasibility study. *BMC Med Res Methodol* 2009; 9: 48. doi:10.1186/1471-2288-9-48
9. Stavrou EP, Smith GS, Baker DF. Surgical Outcomes Associated with Oesophagectomy in New South Wales: An Investigation of Hospital Volume. *J Gastrointest Surg* 2010; 14(6): 951–7. doi:10.1007/s11605-010-1198-7
10. Open Source ChoiceMaker Technology. Available from: http://oscmt.sourceforge.net (Cited 14 December 2010.)
11. Population Health Research Network. Available from: www.phrn.org.au (Cited 14 December 2010.)
12. Australian Research Council and Sargent M. National Collaborative Research Infrastructure Strategy. Canberra: Australian Research Council; 2006. Available from: http://ncris.innovation.gov.au/Pages/SRARI.aspx#Roadmap (Cited 1 August 2010.)
13. Kelman CW, Bass AJ, Holman CDJ. Research use of health data—a best practice protocol. *Aust N Z J Public Health* 2002; 26(3): 251–5. doi:10.1111/j.1467-842X.2002.tb00682.x

Ensuring the policy relevance of population health research: experiences from the Drug Policy Modelling Program

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Abstract: Illicit drugs are an important public health concern. A unique approach to tackling this problem is represented in the work of the Drug Policy Modelling Program which aims to improve evidence-informed policy by reducing the gap between research and policy. There are three elements to the Drug Policy Modelling Program: generating new knowledge; translating evidence into information of relevance for decision makers; and studying policy processes. Key aspects include the use of computer modelling as a translational tool and the focus on understanding policy processes such as the role of media and politics, important in contextualising the research-policy nexus. Other features of the Drug Policy Modelling Program approach include engagement of diverse disciplines, and government researcher partnerships.

Governments across Australia currently invest large amounts of funding in combating drug and alcohol use and their associated harms. In 2004–05 this was estimated to be $5 billion per annum (state and federal governments).[1] Yet the extent to which state and federal governments use research to determine the most appropriate policy options, and introduce policy reform, has been subject to critique.[2,3]

Indeed, the gulf between the world of alcohol and drug research and the world of policy making is large.[4] The Drug Policy Modelling Program aims to reduce the gap between the world of alcohol and drug research and the world of policy through three intersecting elements: (1) generating new knowledge; (2) translating research evidence into information of relevance for decision makers; and (3) studying policy processes. While many Australian researchers engage independently in each of these activities (although largely focused on the first of the three), the Drug Policy Modelling Program sees all three elements as essential to achieve evidence-informed policy. Additionally, the integration and combination of the three elements is required.[5] While translation of research evidence into policy has been an important recent focus of health research, the majority of the work has concentrated on improving the dissemination of research[6] and providing support to policy makers to improve their uptake of research evidence.[7] The Drug Policy Modelling Program supersedes these traditional foci – it is neither dissemination nor uptake alone, but addresses applied research questions of relevance to decision makers, integrates new research evidence with research on public policy and political processes, and develops alternate methodologies to translate evidence.

This paper describes the three elements of the Drug Policy Modelling Program and provides brief examples of the work. Achieving change in policy can take many years, with 17 years cited as an average.[8] The Drug Policy Modelling Program (the Program) is less than 10 years old and hence a full assessment of its impact on policy is premature. Nonetheless, the principles and examples of work provided herein highlight the approach.

The Drug Policy Modelling Program

The Program has been sustained by a core funding grant from a philanthropic organisation (the Colonial Foundation Trust). This has been essential to achieving an applied/practice research focus. Independence of funding from government is vital. In addition, the core funds are supplemented by traditional scientific funding from bodies such as the National Health and Medical Research Council. The Program combines both practical highly-applied research often conceived and conducted in collaboration with government (largely funded from the core funds or by government) with scholarly independent empirical research (largely funded from research bodies). Commissioned research such as project requests from government can be undertaken alongside investigator-driven research. This balance between commissioned and investigator-driven research is important to sustain a research workforce, to enable applied and more empirical work to co-exist, and to

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advance opportunities for mutual learning; commissioned research may also lead to an investigator-driven grant application and vice versa.

Despite a strong applied and practical focus – working with governments on problems and issues as they arise – the location of the Program within the National Drug and Alcohol Research Centre at the University of New South Wales (NSW) provides essential connection with scholarly endeavour. The risk of strongly applied, government-focused research is that it can reduce the opportunity and incentive to publish in peer-reviewed journals; the university auspice encourages peer-reviewed publication and ensures that work meets academic standards. In addition, to be regarded as 'expert' and called upon by governments to assist with policy decision making requires an established academic profile.

Another feature of the Program is the multidisciplinary nature of the team. It includes psychology, criminology, public health, epidemiology, economics, systems approaches, political science and health economics. Working across disciplines has a number of challenges, including different 'world views', methodological differences and mundane but important issues such as different disciplinary norms around authorship. Tackling a complex problem such as illicit drugs requires such a multidisciplinary approach. Most public health problems can no longer be seen as merely health issues: the environment, sociocultural influences, economics and regulation, for example, all provide insights into heath behaviours and new policy solutions. Additionally, there is also the law enforcement element for illicit drugs.

The three elements of the Program

Generating new knowledge

Generation of new knowledge is critical but much research in the drug field is largely marginal to the interests of policy makers. For example, the majority of alcohol and tobacco research is descriptive epidemiology[9] which, while important, does not readily translate to policy or funding options. The challenge is to conduct best practice science on research questions of relevance and meaning to decision makers, and to focus on gaps in knowledge. Within illicit drugs policy, the largest gap is in the evidence base for law enforcement. A comprehensive and systematic search revealed 167 studies published on drug law enforcement[10] which compares poorly to the thousands of published papers on drug treatment.

In redressing this gap, the Program has concentrated on developing a better evidence base regarding the effectiveness of drug law enforcement interventions (Griffith University, Prof Lorraine Mazerolle). This work has included systematic reviews as well as experimental trials of drug law enforcement intervention.[11–13] The Program has also seed funded the first cohort study of street-based injecting drug users (Burnet Institute, A/Prof Paul Dietze).

Strong collaboration with government is essential in bridging the divide between research and policy in the conduct of research. Collaborative research has been undertaken with a number of governments across Australia including the ACT Department of Health, NSW Department of Health, NSW Police and Australian Federal Police. These research projects have commenced with discussions and negotiations regarding important research questions and knowledge gaps. The identification of research questions in collaboration with government then leads to a negotiation regarding appropriate research methods and access to data. The final reports are then provided to government along with other types of dissemination, such as presentations and briefings.

Translating research evidence

There are many barriers to the adoption of research into the policy process.[14–18] Proposed solutions have been extensively documented in the above references and in others. Rather than focus on dissemination *per se*, the Program has concentrated on the active translation from data or science into meaningful information that has value and is readily understood by decision makers. For example, statistical significance testing can be translated into the numbers needed to be treated to achieve a change in population outcomes. In the drug policy work, the primary translation tool of the Program has been computer modelling. Computer models are highly relevant tools for policy decision making because case studies in the real world are difficult; models, built on existing research, can explore policy options not yet implemented. Models can be effective and useful aids for decision-making processes because they represent the complex and dynamic relationships between important variables in the policy domain.[19] The success of modelling, when used as a translational tool, requires effective collaboration between experts in the content domain and experts in modelling alongside effective relationships with governments willing and able to engage in the process.

The Program has used an array of different types of modelling, including system dynamics, agent-based modelling and mathematical modelling. For example, a mathematical model has been developed to explore the provision of hepatitis C treatment: whether it is preferable to provide hepatitis C treatment to those in existing drug treatment (such as methadone maintenance) or to existing injectors.[20] Using system dynamics the Australian pharmacotherapy maintenance treatment system has been modelled to explore scenarios regarding treatment availability and patient co-payments.[21] These models are not predictive in the sense of making projections into the future. They are simulations that provide the opportunity for decision

makers to explore plausible scenarios. For example, the agent-based model simulates a street-based heroin market.[22–24] Building the model required the synthesis of existing research studies and data sources (such as court records) to describe the actions of injecting drug users, police and outreach workers within the simulation. Once built, the model was used to explore the impacts of changing police numbers, the type of policing strategy or the availability of treatment. In workshops with decision makers, the simulations allowed exploration of the intended and unintended effects of potential policy choices, such as increasing the number of police patrols. While a model does not provide a definitive solution for decision making, it provides opportunity to examine plausible policy impacts. In this way, it is a dialogue-based participatory process. Given that policy decisions are rarely driven by a single research outcome[25] modelling fits nicely with thorough understanding of the policy process.

Studying policy processes

A policy decision, whether concerned with major reform or with incremental funding decisions, is a culmination point where multiple factors come together to determine the final outcome. These factors include the research evidence brought to bear but also political factors, perceived public opinion, and practicalities (such as resources). No policy process relies solely on research evidence and the rational consideration of options. For this reason, a comprehensive approach to evidence-based policy must include a focus on policy processes such as the politics and public opinion that can underlie a decision. Many theorists have written about policy processes.[26,27] The application of this body of knowledge, largely from political science, to illicit drug policy in Australia is just commencing.[28]

Public opinion regarding illicit drugs is strong, and public opinion can have a substantial influence on policy decision making.[29] Research that examines the role of public opinion can make an important contribution to understanding both the enablers and barriers to good policy in this domain. Within policy processes, research evidence is used in a myriad of ways.[30] Studying the sources that policy makers use to access research evidence provides useful information for how researchers may better target their dissemination.[31]

Public forums where research evidence is debated and discussed, such as summits, can demonstrate the interplay between research and policy processes.[32] In the illicit drugs area, drug summits have produced transformative policy; for example, the NSW Drug Summit resulted in the establishment of the injecting centre in Kings Cross.[33] This demonstrates the powerful community and political processes that can shape public health policy. Community views, as represented by public opinion and political processes, play an integral role in policy processes; researchers need to be mindful of these processes in striving for evidence-informed policy.

Conclusion

Alcohol and drug harm is a pressing contemporary public health issue. The drug policy research program described herein aims to integrate three key elements: generating new evidence, which relies on knowledge about policy priorities and gaps; translating evidence through the use of computer modelling; and studying policy processes, including the role that public opinion, the media and political processes can play in determining illicit drug policy. Ultimately, we seek to enhance the uptake of research evidence in order to strengthen Australian alcohol and drug policy.

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References

1. Collins DJ, Lapsley HM. The cost of tobacco, alcohol and illicit drug abuse to Australian society in 2004/05. National Drug Strategy Monograph Series No. 64. Commonwealth of Australia; 2008.
2. Hall W. The contribution of research to Australian policy responses to heroin dependence 1990–2001: a personal retrospection. *Addiction* 2004; 99(5): 560–9. doi:10.1111/j.1360-0443.2004.00717.x
3. Fitzgerald J, Sewards T. Evidence-Based Practice in the Australian Drug Policy Community. In: Lin V, Gibson B, editors. Evidence-based health policy: problems and possibilities. Melbourne: Oxford University Press; 2003.
4. Agar M. How the drug field turned my beard grey. *Int J Drug Policy* 2002; 13(4): 249–59. doi:10.1016/S0955-3959(02)00122-6
5. Ritter A, Bammer G, Hamilton M, Mazerolle L. DPMP Team. Effective drug policy: a new approach demonstrated in the Drug Policy Modelling Program. *Drug Alcohol Rev* 2007; 26(3): 265–71. doi:10.1080/09595230701247665
6. Lin V, Gibson B, editors. Evidence-based health policy: problems and possibilities. Melbourne: Oxford University Press; 2003.
7. Edwards M. Social science research and public policy: narrowing the divide. *Aust J Public Administration* 2005; 64(1): 68–74. doi:10.1111/j.1467-8500.2005.00417.x
8. Balas EA, Boren SA. Managing clinical knowledge for health care improvement. In: Bemmel J, McCray AT, editors. Yearbook of Medical Informatics 2000: Patient-Centered Systems. Stuttgart: Schattauer; 2000. pp. 65–70.
9. Sanson-Fisher RW, Campbell EM, Htun AT, Bailey LJ, Millar CJ. We are what we do: research outputs of public health. *Am J Prev Med* 2008; 35(4): 380–5. doi:10.1016/j.amepre.2008.06.039
10. Mazerolle L, Soole D, Rombouts S. Monograph No. 05. Drug law enforcement: The evidence. DPMP Monograph Series. Fitzroy: Turning Point Alcohol and Drug Centre; 2005.

11. Mazerolle L, Soole D, Rombouts S. Street-level drug law enforcement: a meta-analytic review. *J Exp Criminol* 2006; 2(4): 409–35. doi:10.1007/s11292-006-9017-6

12. Mazerolle L, Soole D, Rombouts S. Drug law enforcement: a review of the evaluation literature. *Police Q* 2007; 10(2): 115–53. doi:10.1177/1098611106287776

13. Drew JM. Police responses to the methamphetamine problem: an analysis of the organizational and regulatory context. *Police Q*, in press.

14. Brownson RC, Royer C, Ewing R, McBride TD. Researchers and policymakers: travelers in parallel universes. *Am J Prev Med* 2006; 30(2): 164–72. doi:10.1016/j.amepre.2005.10.004

15. Crosswaite C, Curtice L. Disseminating research results – the challenge of bridging the gap between health research and health action. *Health Promot Int* 1994; 9(4): 289–96. doi:10.1093/heapro/9.4.289

16. Hanney SR, Gonzalez-Block MA, Buxton MJ, Kogan M. The utilisation of health research in policy-making: concepts, examples and methods of assessment. *Health Res Policy Syst* 2003; 1(1): 2. doi:10.1186/1478-4505-1-2

17. Stone D, Maxwell S, Keating M. Bridging research and policy. UK Department for International Development, Radcliffe House, Warwick University: Warwick, UK; 2001. p. 50.

18. Weiss CH, editor. Using social research in public policy making. Lexington, MA: Lexington Books; 1977.

19. Meadows DH, Robinson JM. The electronic oracle: computer models and social decisions. *Syst Dyn Rev* 2002; 18(2): 271–308. doi:10.1002/sdr.239

20. Zeiler I, Langlands T, Murray JM, Ritter A. Optimal targeting of Hepatitis C virus treatment among injecting drug users to those not enrolled in methadone maintenance programs. *Drug Alcohol Depend* 2010; 110(3): 228–33. doi:10.1016/j.drugalcdep.2010.03.006

21. Chalmers J, Ritter A, Heffernan M, McDonnell G. Modelling pharmacotherapy maintenance in Australia: exploring affordability, availability, accessibility and quality using system dynamics. ANCD Research Paper #19. Canberra: Australian National Council on Drugs; 2009.

22. Dray A, Mazerolle L, Perez P, Ritter A. Drug law enforcement in an agent-based model: simulating the disruption to street-level drug markets. In: Liu L, Eck J, editors. Artificial crime analysis systems: using computer simulations and geographic information systems. Hershey, PA: IGI Global; 2008. pp. 352–71.

23. Dray A, Mazerolle L, Perez P, Ritter A. Policing Australia's 'heroin drought': using an agent-based model to simulate alternative outcomes. *J Exp Criminol* 2008; 4(3): 267–87. doi:10.1007/s11292-008-9057-1

24. Perez P, Dray A, Ritter A, Dietze P, Moore T, Mazerolle L. SimDrug: exploring the complexity of illicit drug markets. In: Perez P, Batten D, editors. Complex science for a complex world – Exploring human ecosystems with agents. Canberra: ANU E press; 2006. pp. 193–224.

25. Weiss CH, Murphy-Graham E, Birkeland S. An alternate route to policy influence: how evaluations affect D.A.R.E. *Am J Eval* 2005; 26(1): 12–30. doi:10.1177/1098214004273337

26. Kingdon T. Agendas, alternatives, and public policy. 2nd ed. New York: Longman; 2003.

27. Sabatier PA, editor. Theories of policy processes. Colorado: Westview Press; 2007.

28. Ritter A, Bammer G. Models of policy making and their relevance for drug research. *Drug Alcohol Rev* 2010; 29(4): 352–7. doi:10.1111/j.1465-3362.2009.00155.x

29. Matthew-Simmons F, Love S, Ritter A. Monograph 17: A review of Australian public opinion surveys on illicit drugs. DPMP Monograph Series. Sydney: National Drug and Alcohol Research Centre; 2008.

30. Weiss CH. The many meanings of research utilization. *Public Adm Rev* 1979; 39: 426–31. doi:10.2307/3109916

31. Ritter A. How do drug policy makers access research evidence? *Int J Drug Policy* 2009; 20(1): 70–5. doi:10.1016/j.drugpo.2007.11.017

32. Nathan SA, Develin E, Grove N, Zwi AB. An Australian childhood obesity summit: the role of data and evidence in 'public' policy making. *Aust New Zealand Health Policy* 2005; 2: 17. doi:10.1186/1743-8462-2-17

33. Van Beek I. In the eye of the needle: diary of a medically supervised injecting centre. Crows Nest: Allen & Unwin; 2004.

The Australian Rural Health Research Collaboration: building collaborative population health research in rural and remote NSW

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Abstract: The health problems faced by rural and remote communities are complex and not amenable to simple or short-term solutions. The Australian Rural Health Research Collaboration, which comprises rural research centres, area health services and policy makers in NSW, investigates these problems. Founded in 2002, it has grown to become the leading rural research collaboration in Australia. It aims to: conduct high quality research; build the capacity of researchers and clinicians; and encourage the translation of research evidence into practice for the benefit of rural and remote communities. The success of the Collaboration is illustrated by the increase in research outputs, funds generated, the strength of the relationships between partners and the ability to address complex research problems such as the mental health of rural and remote communities often deemed too difficult or expensive to include in metropolitan-based research. Keys to success have been the inclusive public health ethos, the participation of senior researchers and service managers, the critical mass of researchers achieved through collaboration and effective leadership and governance. This demonstrates the value of supporting cooperative research and capacity building in rural and remote areas where the size of research groups is small and where effective multi-disciplinary and co-operative research can pay dividends.

Rural communities have complex health needs, and these are not fully understood.[1] These needs are often exacerbated by poor access to medical specialists, and in some communities to general health care providers. University-based research groups working with these communities face challenges including distance, physical and professional isolation, relatively small research teams, skill shortages and recruitment difficulties, with limited access to the infrastructure support services provided in metropolitan universities. One response to these challenges is to work in partnership with health service providers and other research centres.

This paper describes the Australian Rural Health Research Collaboration (the Collaboration), its major achievements and the factors which have underpinned these achievements for the researchers, health services and communities it serves.

Structure and governance

The Collaboration was established in 2002 and has focused on conducting research, building research capacity within research units and amongst clinicians, and encouraging the translation of research into practice. The Collaboration comprises: four rural research centres from two universities and three associated former area health services in New South Wales (NSW), the Rural Division of the Clinical Education and Training Institute, and the NSW Department of Health Mental Health and Drug and Alcohol Office. Each research centre has different core specialties including: agricultural health and safety (The Australian Centre for Agricultural Health and Safety, Moree); remote health (The Centre for Remote Health Research, Broken Hill); rural health (The Centre for Rural

Health Research, Lismore); and rural mental health (The Centre for Rural and Remote Mental Health, Orange). They serve diverse populations including coastal communities, remote desert communities and regional cities, each with distinct economies and cultures.

The Collaboration aims for 'sustained improvement in the health of rural communities through strengthened capacity in research and development'.[2]

It is governed by a Board which receives advice from a community-based Advisory Council. This Governing Board is chaired by an honorary director drawn from one of the research centres. The local area health services are represented by their Directors of Population Health, Planning and Performance (DPPP) who participate as full members of the Board. The Board meets on a quarterly basis with two teleconferences and two face-to-face meetings each year which are attended by the Centre or Research Directors, DPPPs and other members.

The Advisory Committee is chaired by a senior public health figure and includes industry and community members drawn from the Area Health Service Advisory Councils (each of the former area health services in NSW had an Advisory Council), ensuring that advice is informed by awareness and knowledge of local health issues, policy and practice.

The Collaboration employs a part-time executive officer who is responsible for the management of the Collaboration and taking action on decisions.

The Board, informed by the Advisory Committee, undertakes medium-term planning and annual research needs assessments led by an area health service DPPP. This planning identifies research priorities and capacity building needs for Collaboration members and clinician researchers in rural NSW.

The Board recognises three categories of research:

- the 'flagship' project which involves all Collaboration members, both research and service partners
- collaboration-supported research which draws on limited Collaboration resources, expertise or funds
- research centre or local research which is of local interest conducted by a particular centre. Local research projects may develop to become collaboration-supported or flagship projects.

Collaboration achievements

Since 2002 the Collaboration has been awarded three NSW Capacity Building Infrastructure Grants (in 2003, 2006 and 2010) in an environment of increasing competition with other NSW research groups. Infrastructure funds that are not tied to particular projects are rare outside those for laboratory settings and these three grants each of $1.5 million over 3 years have provided resources to undertake high quality research and increase research capacity.

The Collaboration has recorded significant achievements in: research productivity; capacity building; and the translation of findings into policy and practice.

There has been one flagship project to date involving all the research centres and area health services. The Australian Rural Mental Health (Cohort) Study[3] has been awarded two National Health and Medical Research Council project grants (2005 and 2009) (NHMRC Projects 401241 and 631061) and is discussed in greater detail later in this paper.

The number of published research papers by Collaboration partners has been substantial with some variation from year-to-year due to the timing and completion of projects. Smaller research centres such as Broken Hill have seen an increase from one paper published in 2002 to 10 in 2009, indicating a developing research capacity. Figure 1 shows the growth of the number of peer-reviewed publications since the inception of the Collaboration. Reports and other outputs are listed in the research centre websites. The increase in publications in 2004–2005 corresponds with the award of University Department of Rural Health status and funds to the Northern Rivers University Department of Rural Health.

The value of research funds across the Collaboration varies from year-to-year and with the timing of large grants. Initially there was little involvement in Category 1 peer-reviewed grants with $250 000 reported in 2002 but this has increased to a peak of $3.5 million reported in 2009.

Capacity building activities include: providing or contributing to research methods courses for novice researchers; courses and mentorship for more experienced centre researchers, such as biostatistical training or advanced

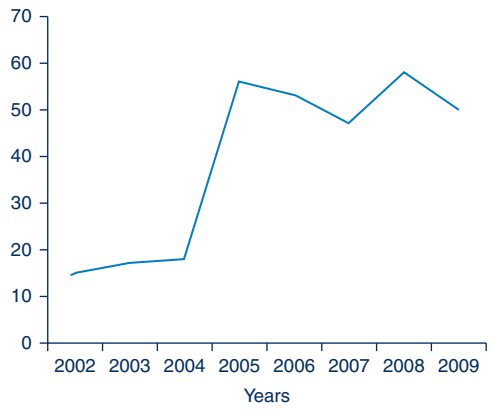

Figure 1. Number of papers published in peer-reviewed journals and book chapters by researchers in Australian Rural Health Research Collaboration research centres, by year. Source: Australian Rural Health Research Collaboration.

writing and publication skills; and a bi-annual research colloquium in which centre researchers and rural clinicians present their findings to a rural audience with international keynote speakers, senior state policy makers and managers. This symposium is structured on the strategic objectives of NSW Health to maximise opportunities for policy dialogue and research translation. Close collaboration over a number of years with the Rural Division of the Clinical Education and Training Institute led to it becoming a full member of the Collaboration in 2009. Senior researchers within the Collaboration regularly contribute to Institute courses in qualitative and quantitative research skills and to mentorship and supervision of rural clinicians and researchers. A feature of the Collaboration has been the support of rurally-based doctoral students through a training and support network and occasional small grants.

Examples of Collaboration research

Australian Centre for Agricultural Health and Safety (Moree)

The aim of the Centre is to 'assist rural Australians to attain improved levels of health and wellbeing by action to reduce the incidence and severity of injury associated with life and work in agriculture'. The Centre maintains national registers of farm deaths and injuries, and conducts major studies on: farm health and safety of children, young people and older farm workers; the development and promotion of safety strategies; and the causes of death, injury and illness on farms. Membership of the Collaboration has provided the Centre with access to a wider range of investigators and research expertise than could be maintained in a small rural town. This has enabled successful collaborative research on: drought and mental health with colleagues from the Northern Rivers University Department of Rural Health and the Centre for Rural and Remote Mental Health;[4–6] farmers' health service use, employing innovative social network analysis;[7–9] programs to promote farmers' mental health in association with the Centre for Rural and Remote Mental Health in partnership with farm organisations;[10] and research on psychiatric epidemiology using the Australian Rural Mental Health Study's flagship cohort addressing the relationship of health and place, family, occupation and environmental events.[3]

The Australian Rural Mental Health (Cohort) Study

Each research centre in the Collaboration has one or more chief investigators working on the project and conducts centre-based data collection activities. Directors of Mental Health and Drug and Alcohol from the former area health services are associate investigators in the study. The study aims to provide a better understanding of patterns of mental health problems in rural communities and their relation to household, community and environmental factors such as drought. The project is beginning to provide data to address problems such as the link between occupation and mental health in rural communities.[11] The involvement of Directors of Mental Health underpins a key objective of the study: to examine patterns of mental health service use and plan improvements to these.

The Study has provided an opportunity to fill a knowledge gap regarding rural and remote mental health and its determinants by combining the research skills of the members with the understanding of service provision provided by health service investigators. A wide range of questions are being investigated including: the relationship between mental health and injury; rural mental health and occupation; mental health and service utilisation; the factors that predispose mental health problems in rural populations;[12] questions of family structure and child health; and topical issues such as perceptions of water availability and their significance for health in various rural populations. Findings from some of these lines of inquiry have been published and others are in train. The Collaboration has enabled the partners to work together on matters of national and international significance in ways that would otherwise be impossible.

Reasons for the success of the Collaboration

The positioning of the Collaboration in a public health framework and its infrastructure funding has been propitious since it enables research in population health, environmental health, agricultural health and safety, primary health care and mental health care. This has further enabled research that crosses boundaries such as the mental health problems experienced by people who live and work on farms and the implications for health and health services of environmental adversity.

The Collaboration has been supported by senior staff from each partner, both academic researchers and service providers. The governance arrangements have been adequate but not over-elaborate. An Advisory Committee has been an important part of the Collaboration governance mechanism and has been a source of advice on the critical health problems and concerns of rural and remote communities.

The Collaboration has enabled the development of a large and flexible team of researchers which could not be achieved at any of the rural or remote centres alone. This has enabled the members to become increasingly competitive for research funding, which draw upon larger numbers and a broader range of experienced staff. This is very important since the health problems faced by rural and remote communities are complex and not amenable to simple or short-term solutions.

The Collaboration has had four directors from three research centres who have given time to the leadership and management of the Collaboration. It has funded a

part-time administrator, and other costs of collaboration such as meeting and travel costs for Advisory Committee members and to and reporting costs. This combination of leadership and administration to action decisions has been critical to performance and progress.

The provision of NSW Health infrastructure funding to the Collaboration has been vital to complement the costs borne by Collaboration partners. The competitive funding process has sharpened strategic thinking on a regular basis and in considering the needs and priorities of the funder and the rural constituency.

The Collaboration has been viewed by its partners as an opportunity. Each of the research centres have other collaborators in their specialist disciplines within NSW, across Australia and internationally. It has provided an effective means to identify collaborators for research proposals and to reinforce skills that are in short supply or absent within a particular centre.

The Collaboration has acted as a catalyst and assisted the member centres to grow in a number of ways. It has provided a mechanism for senior researchers, service managers and policy makers to work together in rural settings where there are shortages of experienced staff and skills unlike the large research groups in metropolitan centres. It has enabled the sharing of expertise that would be much more difficult without the regular association and joint working facilitated by the Collaboration.

Within the Collaboration the research centres remain as autonomous entities with their own capabilities, goals and activities but membership provides a mechanism for sharing skills and participating in larger activities than would otherwise be possible.

The research centres still have different strengths in the fields of research, capacity building and translation. This is demonstrated by the balance of outputs between investigator-driven research papers, guidelines and publications designed for end users rather than other researchers. It is the sharing of these strengths that has underpinned the performance and value of the Collaboration to its members and to the rural communities of NSW. These activities have demonstrated that research can be embedded in rural settings and that a culture of enquiry is not limited to larger metropolitan communities.

Conclusion

The Australian Rural Health Research Collaboration, supported by infrastructure funds from NSW Health, has enabled the growth of rural research centres that have active relationships with their area health services and are able to address some of the major health problems faced by rural communities. Rural research groups are never likely to reach the size of their metropolitan competitors and so will increasingly need to work in partnerships to balance the benefits of scale with those of local knowledge, responsiveness and credibility. The Collaboration faces new challenges with the health system reforms and new structural entities but the most important priorities are researching the health of rural populations in ways that will produce new and viable solutions sufficiently robust to meet population health needs in conditions that are often challenging due to natural and man-made adversity.

References

1. Smith KB, Humphreys JS, Wilson WGA. Addressing the health disadvantage of rural populations: How does epidemiological evidence inform health policies and research? *Aust J Rural Health* 2008; 16(2): 56–66. doi:10.1111/j.1440-1584.2008.00953.x
2. Australian Rural Health Collaboration Annual Report. Broken Hill, NSW; 2010.
3. Kelly BJ, Stain HJ, Coleman C, Perkins D, Fragar L, Fuller J et al. Mental health and well-being within rural communities: the Australian Rural Mental Health Study. *Aust J Rural Health* 2010; 18(1): 16–24. doi:10.1111/j.1440-1584.2009.01118.x
4. Sartore G, Kelly B, Fuller J, Fragar L, Stain HJ, Tonna A. Improving mental health capacity in rural communities: Mental health First Aid delivery in drought affected rural NSW. *Aust J Rural Health* 2008; 16(5): 313–8. doi:10.1111/j.1440-1584.2008.01005.x
5. Sartore GM, Kelly B, Stain H, Albrecht G, Higginbotham H. Control, uncertainty, and expectations for the future: a qualitative study of the impact of drought on a rural Australian community. *Rural Remote Health* 2008; 8(3): 950.
6. Tonna A, Kelly B, Crockett J, Buss R, Roberts R, Wright M et al. Improving the mental health of drought affected communities: an Australian model. *Rural Soc* 2009; 19(4): 296–305.
7. Fuller J, Kelly B, Sartore G, Fragar L, Tonna A, Pollard G et al. Use of social network analysis to describe service links for farmers' mental health. *Aust J Rural Health* 2007; 15(2): 99–106. doi:10.1111/j.1440-1584.2007.00861.x
8. Fuller JD, Kelly B, Law S, Pollard G, Fragar L. Service network analysis for agricultural mental health. *BMC Health Serv Res* 2009; 9: 87. doi:10.1186/1472-6963-9-87
9. Sartore G, Kelly B, Fragar L, Fuller J, Stain H, Tonna A et al. Building and evaluating effective mental health networks in rural communities. *Acta Neuropsychiatr* 2006; 18: 269–70.
10. Fragar L, Kelly B, Henderson A, Tonna A, Peters M. Partnerships to promote mental health of NSW farmers – the New South Wales Farmers' Blueprint for Mental Health. *Aust J Rural Health* 2008; 16(3): 170–5. doi:10.1111/j.1440-1584.2008.00968.x
11. Fragar L, Stain HJ, Perkins D, Kelly B, Fuller J, Coleman C et al. Distress among rural residents: does employment and occupation make a difference? *Aust J Rural Health* 2010; 18: 25–31. doi:10.1111/j.1440-1584.2009.01119.x
12. Kelly BJ, Lewin TJ, Stain HJ, Coleman C, Fitzgerald M, Perkins D et al. Determinants of mental health and well-being within rural and remote communities. *Soc Psychiatry Psychiatr Epidemiol* 2010; 14(October).

Population Health Intervention Research Initiative for Canada: progress and prospects

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Abstract: Actions in Canada are being designed to transform the way research evidence is generated and used to improve population health. Capacity is being built in population health intervention research. The primary target is more understanding and examination of policies and programs that could redress inequities in health. The Population Health Intervention Research Initiative for Canada is a loosely-networked collaboration designed to advance the science of the field as well as the quantity, quality and use of population health intervention research to improve the health of Canadians. In the first few years there have been new training investments, new funding programs, new working guidelines for peer review, symposia and new international collaborations. This has been brought about by the strategic alignment of communication, planning and existing investments and the leveraging of new resources.

System-level change processes embed and become successful when the motives and perceived benefits of different people, organisations and processes harmonise. This paper describes how such an alignment of interests was achieved in the population health intervention research field in Canada and the strategies that are now taking it forward. The Population Health Intervention Research Initiative for Canada is a collaboration of research funders, non-governmental organisations, policy makers, researchers and trainees trying to shift the knowledge base for population and public health from a system that currently privileges description and analysis of health problems to one that caters more strongly to identifying and studying the outcomes of the policies and programs that will reduce health problems and health inequities and embed these into everyday practice. This paper outlines progress to date and new horizons for action.

Impetus and early development of the Population Health Intervention Research Initiative for Canada

Canada has a strong history in population and public health. Some of the best known outputs include the work produced under the rubric of the Canadian Institute for Advanced Research program on population health in a 10-year period spanning the 1980s and 1990s. The Institute is an interdisciplinary private not-for-profit research institute that provides leading scholars with the time, direction, freedom and inspiration to pursue fundamental questions concerning society, technology and the very nature of humanity and the universe.[1] The population health program yielded outputs that were highly successful in reframing mainstream thinking about health (particularly that seen in government documents) and for putting social determinants of health into prominence.[2,3]

While not without its critics,[4,5] the program was pivotal in generating funding and institutional structures to facilitate population and public health research. For example, federal funding for the Canadian Population Health Initiative, based within the Canadian Institute for Health Information (1999), helped to ensure that population health had a strong presence when Canada's Medical Research Council was redesigned as the Canadian Institutes of Health Research in 2000. Population and public health became the strategic focus of one of the 13 virtual institutes, the Institute of Population and Public Health. The field of social, cultural, environmental and population health was also made one of the four 'pillars' for categorising research across the Canadian Institutes of Health Research. The other three pillars are biomedical research, clinical research and health services research. The mission of the Institute of Population and Public Health is to improve the health of populations and promote health equity in Canada and globally by supporting research and encouraging its application to policies, programs and practices in public health and other sectors through strategic research investments. It also acts as a resource, guide and catalyst on population health research to the other Institutes and the Canadian Institutes

Box 1. Brief guide to some key pan-Canadian health agencies

Canadian Institutes of Health Research	The main health research funding agency (like Australia's National Health and Medical Research Council). Seventy percent of funds are for open competition whereas 30% are for strategic initiatives including but not limited to funding competitions in priority areas set by 13 Institutes (each with a Scientific Director, an Institute Advisory Board and Institute staff).
Canadian Institute for Health Information	An independent, not-for-profit organisation that provides essential information on Canada's health system and the health of Canadians (like the Australian Institute of Health and Welfare).
Canadian Population Health Initiative	An arm of the Canadian Institute for Health Information established to improve public understanding of population health and to contribute to policy making to reduce health inequities and improve health. Focus is on knowledge generation, synthesis, reporting and exchange.
Public Health Agency of Canada	Responsible for: promoting health; preventing and controlling disease and injury; preparing for and responding to public health emergencies; and strengthening public health capacity.

of Health Research as a whole. Box 1 explains the pan-Canadian health agencies in Canada referred to in this article.

The Population Health Intervention Research Initiative for Canada grew out of a meeting of key people and organisations held in Banff in September 2006 which noted that, within the Canadian public and population health research context, sophisticated analytic descriptions of increasingly sick populations receive emphasis (some might say too much emphasis). Insufficient attention, however, was being given to interventions to improve population health. This tendency had also been observed in the United Kingdom.[6] A 2001–2006 review of grants awarded at the Canadian Institutes of Health Research showed that only 6% evaluated the impact of policies or programs to improve health.[7] The Population Health Intervention Research Initiative for Canada was established to increase the quantity and quality of use of population health intervention research, as well as to align and embed activities supporting this across the knowledge production and knowledge use system.

Population health intervention research is defined as the use of scientific methods to produce knowledge about policy and program interventions that operate within or outside the health sector and have the potential to impact health at the population level.[8] Impact at the population level does not only mean improving health or reducing health risks; it also means designing/implementing interventions which change the conditions of risk in order to shift the distribution of health risk,[9] in keeping with the ideas of Geoffrey Rose.[10] To be truly effective, a population health intervention should reduce risk exposure in successive cohorts of people within the setting(s) under investigation. Thus, as well as population health intervention research being an umbrella term that incorporates fields like health promotion research, health impact assessment, policy analysis and evaluation research, population health intervention research is designed to improve understanding of interventions addressing 'upstream' determinants of health, where some of the greatest long term gains may be realised.

A special supplement of the *Canadian Journal of Public Health* in 2009 documented the purpose of the Population Health Intervention Research Initiative for Canada, the rationale and the collaborating partners.[7,11–16] This represented championship at the level of provincial health delivery systems, pan-Canadian health research agencies, university-based researchers, non-governmental organisations, and support at the Public Health Agency of Canada.

Strategies and actions to support intervention research production and use

The Population Health Intervention Research Initiative for Canada is stewarded by a planning committee made up of non-governmental organisations, health research funding agencies, researchers and public health policy makers and delivery organisations. It meets twice a year. The strategic plan encompasses four areas (Box 2).

The fundamental strategy is to work systematically on both the 'demand' and 'supply' sides of the population health intervention research equation, creating activities that increase the capacity to fund (e.g. operating grants and peer review guidelines) and conduct (e.g. training) population health intervention research as well as activities that encourage uptake and use, such as requirements for researcher–policy maker partnerships in knowledge production.

Population Health Intervention Research Initiative for Canada meetings provide opportunities to brainstorm

Box 2. Population Health Intervention Research Initiative for Canada: strategic objectives

1. Advance the science of population health intervention research.
2. Strengthen Canada's capacity to conduct and use relevant population health intervention research for policy and practice.
3. Enhance Canada's contribution to the global knowledge base on population health interventions through continuous learning and international collaborations.
4. Champion population health intervention research and enhance its profile and usefulness.

new ideas and to align activities within each organisation in ways that maximise synergy and benefits. The Population Health Intervention Research Initiative for Canada is not an organisational structure that makes research funding decisions or develops Requests for Applications. The strategy is more high level and horizontal (e.g. planning symposia and communication tools, identifying infrastructure gaps, and alignment of activity where there is mutual interest). The Population Health Intervention Research Initiative for Canada (PHIRIC) has catalysed work on new criteria for peer review of intervention research to allow greater consideration of process evaluation as well as the relevance of the intervention to the population group. PHIRIC has also been a forum where agencies have reported on their own initiatives in line with PHIRIC objectives. An example is the Public Health Agency of Canada which has guided the focus of their investments away from smaller grants dispersed widely, towards larger targeted grants in priority areas (mental health promotion and obesity). This, along with new funding guidelines and procedures, has allowed for the development and testing of promising innovations and the building of stronger data systems to track and sustain them (Box 3).

PHIRIC is not a research or training body itself – it is a collaboration and coordination mechanism. While catalysed and supported by the Canadian Institutes of Health Research's Institute of Population and Public Health (which provides the secretariat functions), the key strength of PHIRIC is that it 'belongs' to no particular organisation and has no earmarked special funding. Rather, PHIRIC is about levering and growing commitments towards population health intervention research in participating organisations' own budgets, in various ways, organically. For example, the PHIRIC definition for population health intervention research has been adopted into numerous Requests for Applications across multiple agencies. The peer review guidelines have been designed and tested collaboratively across key agencies, also with the view to wide uptake upon completion.

An economic evaluation on the return on investment in PHIRIC operations has conservatively estimated that for every dollar invested, that is, direct and indirect costs of the secretariat and in terms of the key participating people and organisations (including travel and meeting costs for the planning committee, symposia/events, consultancy advice, administration and communication functions and people's time attending meetings and working on key tasks), another $30 is being leveraged for packages of intervention research and training across Canada within the participating key agencies. These are for a broad range of beneficiaries, of the kind illustrated in Box 3.[17]

Growth and new horizons

PHIRIC has moved through the classic, 'text book' stages of collaborative problem-solving over time.[18] At the beginning, the focus had to be on getting the 'right' organisations assembled, relying on broad and undifferentiated structures for engagement so as to maximise information exchange and identify common values.[18] After the mission was identified and the tasks were set, different structures allowed for more focused, efficient, coordinated workflow (e.g. working groups).[18] PHIRIC now has working groups in training, communication, evaluation and peer review. For example, the Evaluation Working Group will be collecting data that will allow us to assess: the leadership and championship role of population health intervention research at an organisational and system level; the extent to which there have been changes in the appraisal and support of evaluation of funding population health intervention studies; and the evaluation of training in population health intervention research, evaluation and knowledge exchange. The Training Working Group is pooling ideas and refining ways of measuring population health intervention research competencies. The Communication Working Group is designing fact sheets, webinars, case studies and a video.

Participation within the PHIRIC planning committee will be reviewed as activities grow and new constituencies form as a consequence. For example, right now there is no organised group of population health intervention research scientists in Canada, and so the researchers who happened to have been involved in PHIRIC's early development bore no formal communication responsibility or representational accountability to their peers. This is likely to change with symposia, publications and granting rounds now bringing the field into stronger definition.

Next steps for PHIRIC are about connecting more broadly with the intervention research in sectors other than health, and the researchers conducting it. In a nascent field like population health intervention research, we need to appreciate which words and phrases about evaluation research and integrated evidence into policy strike a chord (and which do not). Under the leadership of the Canadian

Box 3. Examples of alignments and strategies to foster population health intervention research during the early years of the Population Health Intervention Research Initiative for Canada

New funding streams created	• New 'rapid response' funding stream within Canadian Institutes of Health Research to evaluate new policy (e.g. tobacco pricing, transport route alterations, food retail outlet changes). • Public Health Agency of Canada's Innovation Strategy: Taking Action to Reduce Health Inequalities in Canada. • Built Environment: Population Health Intervention Research. Heart and Stroke Foundation of Canada, in partnership with the Canadian Institutes of Health Research: Institute of Circulatory and Respiratory Health; Institute of Human Development, Child and Youth Health; Institute of Musculoskeletal Health and Arthritis; Institute of Nutrition, Metabolism and Diabetes; and Institute of Population and Public Health.
New research career positions created within decision-maker partnerships (e.g. municipal governments, public health agencies)	• Applied Public Health Chairs, funded by Canadian Institutes of Health Research and the Public Health Agency of Canada.
New training investments in population health intervention research	• New 6-year training grants through Canadian Institutes of Health Research (Strategic Training in Interdisciplinary Health Research awards).
New products and procedures in research development and knowledge translation	• Development of peer review guidelines for population health intervention research. • Casebook on examples of population health intervention research. • Special supplement to *Canadian Journal of Public Health* on population health intervention research. • New associate editor position at the *Canadian Journal of Public Health* for intervention research.
New collaboration to foster the field of population health intervention research internationally	• Joint meetings on population health intervention research with Medical Research Council (UK) and Economic and Social Research Council (UK). • Joint conference on the science of community intervention research organised with the Centers for Disease Control (USA).

Institutes of Health Research's Institute of Population and Public Health a symposium and workshop in late 2010 also showcased intervention studies and spotlighted some of the debates on advancing the science of this field and building links with research in related fields (e.g. implementation systems and improvement science).

PHIRIC resisted having any formal priority areas early in its development, for fear that these might bow to pressure to mimic standard chronic disease domains, create 'winners and losers' in this process and potentially take PHIRIC away from a whole-system focus. This decision proved wise, allowing organisations at the PHIRIC table to follow their own priority concerns and develop stronger investment in intervention research in whatever domains resonated with their stakeholders and partners. Most likely, PHIRIC's strength will continue to come from strategies that have worked previously – that is, finding like-minded people and initiatives, building partnerships and opening up possibilities to consolidate resources.

The question of priorities has risen again recently. This time, system-focused priority areas have been readily embraced. The leading idea is that PHIRIC must create stronger system-level *demand* for population health intervention research. The unharnessed lever for the demand is public interest.

Right now, Canada is better at tracking the uneven distribution of Canadians' health problems than at accounting

for this distribution, in part, by the uneven distribution of known effective solutions (both on the treatment and prevention side).[19,20] Yet, where data systems within some authorities are strong, convincing causal stories can be made linking reminder systems with immunisation rates,[21] mobile services with uptake of mammography[21] and workplaces with comprehensive tobacco control policies with higher smoking quit rates among their employees.[22]

Hence, PHIRIC's newest vision is to prompt more public awareness about which preventive policies and programs are being routinely delivered to whom with what effects. Hopefully then the public may come to demand better preventive policies and programs with the same vigour they currently reserve for accessing health care.[19,20] Increased public accountability would in turn prompt better investment in data systems across the sectors, to track the distribution of these policies and programs. Better data systems about delivery of or exposure to policies and programs that have the potential to improve health at the population level will in turn invite more research linking these exposures with outcomes and their distribution. This goal is now within PHIRIC's sights. This is just one aspect of population health intervention research, but one firmly in the interests of many partners.

Conclusion

It might be easy to think that PHIRIC is possible simply because of Canada's historic commitment to the field of population and public health research. While this provided one ready constituency to harness, we chiefly attribute the success of PHIRIC to its organisational form. PHIRIC is a loosely structured alliance that relies on no particular champion or funding stream, enabling each agency and group taking part to work out how to make their own agenda more 'PHIRIC-like'. For example, for a funder this means creating population health intervention research and training funding streams. For a health delivery agency it means making a stronger commitment to planning and evaluation. Both benefit from better intervention research review criteria and relevant options in knowledge translation. As such, PHIRIC fits the criteria of a 21st century networked organisation.[23] It is carried forward by many actors, it adjusts its shape to fit the circumstances, and it is powered by events and forums that bring supply and demand for intervention research together. This heterogeneity creates strength and allows vision beyond what each actor could achieve alone.

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References

1. Canadian Institute for Advanced Research. Available from: www2.cifar.ca
2. Evans RG, Stoddart GL. Producing health, consuming health care. *Soc Sci Med* 1990; 31(12): 1347–63. doi:10.1016/0277-9536(90)90074-3
3. Evans RG, Barer M, Marmor TR, editors. Why Are Some People Healthy and Others Not? The Determinants of Health of Populations. New York: Walter de Gruyter, Inc; 1994.
4. Raphael D, Bryant T. The limitations of population health as a model for a new public health. *Health Promot Int* 2002; 17(2): 189–99. doi:10.1093/heapro/17.2.189
5. Labonte R. The population health/health promotion debate in Canada: the politics of explanation, economies, and action. *Crit Public Health* 1997; 7: 7–27. doi:10.1080/09581599708409075
6. Milward L, Kelly M, Nutbeam D. *Public health intervention research: the evidence.* London: Health Development Agency; 2001.
7. Di Ruggiero E, Rose A, Gaudreau K. Canadian Institutes of Health Research support for population health intervention research in Canada. *Can J Public Health* 2009; 100(Suppl.): I15–9.
8. Population Health Intervention Research Initiative for Canada. ('PHIRIC') Workshop Report. 26–27 September 2006, Banff Centre, Banff, Alberta, Canada. Canadian Institutes for Population and Public Health. Institute of Population and Public Health. Available from: www.Canadian Institutes of Health Research-irsc.gc.ca/e/33515.html
9. Canadian Institutes of Health Research. Institute of Population and Public Health. Mapping and Tapping the Wellsprings of Health. Strategic Plan. 2002–2007.
10. Rose G. The Strategy of Preventive Medicine. Oxford University Press; 1992.
11. Butler-Jones D. Public health science and practice: from fragmentation to alignment. *Can J Public Health* 2009; 100(Suppl.): I1–4.
12. Sullivan L. Introduction to the Population Health Intervention Research Initiative for Canada. *Can J Public Health* 2009; 100(Suppl.): I5–7.
13. Hawe P, Potvin L. What is population health intervention research? *Can J Public Health* 2009; 100(Suppl.): I8–14.
14. Riley BL, Stachenko S, Wilson E, Harvey D, Cameron R, Farquharson J et al. Can the Canadian Heart Health Initiative inform the Population Health Intervention Research Initiative for Canada? *Can J Public Health* 2009; 100(Suppl.): I20–6.

15. Cameron R, Riley RL, Campbell HS, Manske S, Lamers-Bellio K. The imperative of strategic alignment across organizations: the experience of the Canadian Cancer Society's Centre for Behavioural Research and Program Evaluation. *Can J Public Health* 2009; 100(Suppl.): I27–30.

16. Kendall P. Commentary on population health intervention research. *Can J Public Health* 2009; 100(Suppl.): I31–2.

17. Shiell A. The Population Health Intervention Research Initiative for Canada: an estimate of the return on investment. Population Health Intervention Research Centre, University of Calgary; September 2010.

18. McCann JE. Design guidelines for social problem solving interventions. *J Appl Behav Sci* 1983; 19(2): 177–89. doi:10.1177/002188638301900213

19. Hawe P, Shiell A. Using evidence to expose the unequal distribution of problems and the unequal distribution of solutions. *Eur J Public Health* 2007; 17(5): 413. doi:10.1093/eurpub/ckm095

20. Hawe P, Shiell A. Creating demand for a disease prevention and health promotion system. In: Roach R, editor. Alberta's Energy Legacy: Ideas for the Future. Calgary: Canada West Foundation; 2007.

21. Martens P, Fransoo R, The Need to Know Team, Burland E, Prior H, Burchill C et al. What Works? A First Look at Evaluating Manitoba's Regional Health Programs and Policies at the Population Level. Winnipeg: Manitoba Centre for Health Policy; March 2008.

22. Statistics Canada. Smoking bans. Influence in smoking prevalence. *Health Rep* 2007; 18(3): 9–24.

23. Weber EP, Khademian AM. Wicked problems, knowledge challenges, and collaborative capacity builders in network settings. *Public Adm Rev* 2008; 68: 334–49. doi:10.1111/j.1540-6210.2007.00866.x

Obituary: Professor Frank Fenner (1914–2010)

On 22 November 2010, the renowned and iconic virologist, microbiologist and public health champion, Professor Frank Fenner died at age 95 in Canberra. Best known internationally as the person who led the eradication of smallpox, overseeing the World Health Organization's (WHO) Global Commission for the Certification of Smallpox Eradication in the 1970s and 1980s, Fenner's work and achievements in medical science had a strong focus on population and public health locally and internationally.

During World War II Fenner was involved in a drive to control the impact of malaria on Australian troops serving in New Guinea. He was awarded an MBE for his effective management of malaria, which significantly reduced casualty rates among foot soldiers.

Fenner's expertise in virology developed working alongside Sir Frank Macfarlane Burnet at the Walter and Eliza Hall Institute in Melbourne after the war. He applied his proficiency in pox viruses, including smallpox and myxoma, with a focus on public and population heath concerns. As well as more than 10 years working with the WHO to eradicate smallpox, Fenner offered the viral disease myxomatosis as a solution to the damage that Australia's wild rabbit plague was wreaking on local agricultural production. In 1952 he, along with colleagues Burnet and Ian Clunies Ross, went as far as injecting themselves with the virus to prove its safety in humans despite its efficacy among the rabbit population.

These high impact achievements have been nationally and internationally recognised. In 1988, Fenner was awarded the most prestigious applied science award – the Japan Prize – for achieving smallpox eradication; and became a Companion of the Order of Australia in 1989. Fenner's significant contributions were also commemorated in a state memorial service in Canberra, held on 2 December 2011. A continuing drive in the field of public health saw Fenner working beyond retirement, at the Australian National University's School of Environment and Society – which he founded in 1973. His continuing research activities were prolific, as demonstrated by the hundreds of research papers published and authorship of textbooks. In addition, Fenner actively supported Australian research and researchers, preferring to publish in local journals, mentoring Australian researchers and hosting an annual Australian Academy of Science Fenner conference (collaborating with the *Bulletin* to publish conference material locally). In recent years the conference has brought to the fore issues such as health in the built environment and health in the face of climate change. An additional aim of this ongoing annual conference is to support talented young researchers early in their career.

With regard to climate change, Fenner did not hold the optimism of many scientists and politicians, but believed that ever growing populations and food shortages would bring increasing social upheaval, famine, war, and eventually the end of human kind.

In accordance with Fenner's demonstrated dedication to research aimed at improving human wellbeing and benefiting society, the Minister for Mental Health and Ageing, the Hon Mark Butler MP, has announced a new National Health and Medical Research Council fellowship, the Frank Fenner Early Career Fellowship, to commemorate Fenner's extraordinary contribution to science and public health. The Fellowship will benefit researchers in the field of international health early in their career, with the first award to be announced in 2011.

Fenner's achievements are captured more fully in the following obituaries:

http://www.telegraph.co.uk/news/obituaries/8152284/Professor-Frank-Fenner.html

http://www.theaustralian.com.au/news/nation/frank-fenner-who-eradicated-smallpox-and-ended-rabbit-plague-dead-at-95/story-e6frg6nf-1225958840687

http://www.theage.com.au/national/the-man-who-killed-smallpox-dies-at-95-20101122-1845h.html?from=age_sb

http://www.smh.com.au/national/scourge-of-smallpox-and-rabbits-was-a-genuine-hero-20101122-1848g.html

Alana Lessi for the Bulletin

Risk communication in public health

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Risk communication is fundamental to public health practice and critical to the success of any public health response. Effective risk communication is essential for improving public understanding of potential or actual health threats and helps the public to make informed decisions about risk mitigation measures.

Risk communication has been defined as a two-way exchange of information between interested parties about the nature, significance and/or control of a risk.[1] In public health, this means that engaging the audience and responding to questions and concerns is equally as important as delivering key public health messages. The strategies used for communicating risk are based on the level of hazard a particular risk poses as well as the level of public concern or 'outrage' about that hazard.[2] For example, a health risk may be low but subject to high levels of public concern and media attention.

Sandman has developed four stages of risk communication based on the levels of risk and outrage generated by an issue.[2] The first stage is 'precaution advocacy', where outrage is low but the hazard is high. Here, the necessary strategy involves creating outrage in order to get the audience's attention. The second stage is 'outrage management', where outrage is high but the level of hazard is low. These hazards invariably attract media attention so there may be high levels of emotion to respond to. The third stage is 'crisis communication', where both hazard and outrage are high. This stage applies to large scale incidents where the challenge is managing the size of the incident. The final stage is 'stakeholder relations', where both hazard and outrage are low. The main task in this stage is providing open discussion to address questions from the public.[2]

The five best practices for risk communication developed by the World Health Organization provide a sound framework on which to base communication strategies. The practices are: build trust; announce early; be transparent; respect public concerns; and plan in advance.[3] Establishing trust with the public is the most critical aspect of effective risk communication. Without trust public health messages are more likely to be disregarded. Trust is hard to build and easy to erode.[4] Top-down communication, unresponsiveness, a lack of transparency and wrongly over or under-emphasising health risks can contribute to the erosion of trust. Trust is built with better engagement which enhances confidence in the authority's ability to manage the situation.

Risk communication and the media

Engaging with the media is an important but challenging task. The goals and processes of the media can differ from those of public health professionals and include very short timeframes, differing concepts of 'evidence' and the need for individual case examples. Some key considerations for public health professionals engaging with the media include: being accessible and proactive; being prepared; developing concise key messages in advance which are emphasised during the interview; anticipating questions; and having information on hand. The internet and social media pose the potential for the spread of unsubstantiated rumours about health risk but also new opportunities for communicating health messages.

Risk communication in communicable diseases

The challenges posed in communicating risks during communicable disease outbreaks include: the complexity of the disease pathophysiology and epidemiology; the capacity for individual actions to influence the health of others (e.g. respiratory hygiene, vaccine refusal); and the political, economic and social context in which the outbreak occurs.[3]

Pandemic (H1N1) 2009 influenza highlighted these challenges. Rapidly evolving knowledge about the epidemiology of the disease and its impact required ongoing communication with all involved groups. Key tasks for public health professionals were: to ensure the dissemination of key messages about disease control; to ensure the media were regularly updated; and to acknowledge uncertainty. They also had to understand the concerns of the public and respond accordingly. These efforts help to maintain the confidence and trust of the public and, ultimately, lead to the relevance and effectiveness of public health messages.

References

1. Covello VT. Risk communication and occupational medicine. *J Occup Med* 1993; 35(1): 18–9.
2. Sandman PM (2003). Four kinds of risk communication. Available from: http://www.psandman.com/index-intro.htm (Cited 13 April 2010.)
3. World Health Organization (WHO). Outbreak communication: best practices for communicating with the public during an outbreak. Report of the WHO expert consultation on outbreak communications, 21–23 September 2004. Available from: http://www.who.int/csr/resources/publications/WHO_CDS_2005_32web.pdf (Cited 13 April 2010.)
4. Slovic P. Perceived risk, trust and democracy. *Risk Anal* 1993; 13(6): 675–82. doi:10.1111/j.1539-6924.1993.tb01329.x

 10.1071/NB10055

Communicable Diseases Report, NSW, November and December 2010

Communicable Diseases Branch
NSW Department of Health

For updated information, including data and facts on specific diseases, visit www.health.nsw.gov.au and click on **Public Health** and then **Infectious Diseases**. The communicable diseases site is available at: http://www.health.nsw.gov.au/publichealth/infectious/index.asp.

Figure 1 and Tables 1 and 2 show reports of communicable diseases received through to the end of November and December 2010 in New South Wales (NSW).

Enteric infections

Outbreaks of foodborne disease

Nine outbreaks of suspected foodborne disease were investigated in November and December 2010. Stool specimens were collected and tested in two of these outbreaks and *Salmonella* Typhimurium was identified. One of these outbreaks was linked to salmon patties made with raw eggs, however no leftovers were available for testing and samples from the premises were negative. In the second outbreak the local public health unit (PHU) identified *S.* Typhimurium in two people who attended a conference. Through their investigation, the local PHU identified a further five possible cases. However, as detailed menu information was not collected and no samples were taken from the venue the food vehicle remains unknown.

Another outbreak was identified through three separate reports to the NSW Food Authority about a bakery and was found to be linked to the consumption of pork rolls. The eight affected people did not submit stool samples but food and environmental samples taken from the premises were all positive for *S.* Typhimurium.

In the remaining six outbreaks, none of the cases submitted a stool specimen for testing so the causative pathogen of the outbreaks could not be identified.

Outbreaks of gastroenteritis in institutional settings

During November and December, 43 outbreaks of gastroenteritis in institutions were reported, affecting 539 people. Twenty-three outbreaks occurred in child care centres, 14 in aged care facilities, five in hospitals, and one in a mental health facility. All outbreaks appeared to have been caused by person-to-person spread of a viral illness. In 22 outbreaks (51%) one or more stool specimens were collected from cases; in six of these outbreaks (27%) norovirus was detected, and in five (23%) stool specimens tested positive for rotavirus. The remaining 11 outbreaks had negative test results. Viral gastroenteritis tends to peak in winter with around 15 outbreaks per week; over the past 5 years in November and December the average number of outbreaks has been 47.

Respiratory and other infections

Influenza

During November and December influenza activity was low in NSW, as measured by the number of patients who presented to 56 of the state's largest emergency departments with influenza-like-illness. There were 147 emergency department presentations of patients with influenza-like illness (1.0 per 1000 presentations) for November and 129 presentations (0.7 per 1000 presentations) for December.

The number of patients who tested positive for influenza at diagnostic laboratories was slightly above the usual level for this time of year. There were 41 cases of laboratory-confirmed influenza (including 18 of pandemic (H1N1) 2009) reported in November. Of these 12% were aged 0–5 years, 20% were aged 5–9 years and 46% were aged 15–49 years. In December, 46 cases were reported (including 37 of pandemic (H1N1) 2009). Of these, 15% were aged 0–5 years, 15% were aged 5–9 years and 50% were aged 15–49 years.

For a more detailed report on respiratory activity in NSW see: http://www.health.nsw.gov.au/PublicHealth/Infectious/influenza_reports.asp

Vaccine-preventable diseases

Meningococcal disease

Nine cases of meningococcal disease were reported in NSW in November and December (12 cases were reported in the same period in 2009). The ages of the affected people

10.1071/NB11006

ranged from 3 to 70 years (three cases were children aged less than 5 years). One case (in an unvaccinated adult) was caused by serogroup C, for which there is a vaccine. Six cases were caused by serogroup B, one case by serogroup W135, and one case by serogroup Y.

In 2010, 73 cases of meningococcal disease were reported in NSW (including five deaths, one an infant aged 0–4 years) compared to 92 cases in 2009 (including four deaths in adults).

A free vaccine for serogroup C meningoccocal disease is available for infants at 12 months of age. Consequently, serogroup C meningococcal disease is now mainly seen in adults and in unimmunised children. In NSW in 2010, 82% of cases of meningococcal disease (where the serogroup was known) were caused by serogroup B, for which there is no vaccine.

Pertussis (whooping cough)

During November and December, 3450 cases of pertussis were reported in NSW. Over 20 000 cases of pertussis were reported during 2008 and 2009. Case reports declined to a low in April 2010 (with 314 cases reported), but since then have increased, with 1860 cases reported in November and 1590 cases in December. The number of reported cases was highest in children aged 5–9 years and 10–14 years. In total, 9244 cases were reported in 2010 compared with 12 577 in 2009.

A free vaccine is recommended for infants at 2, 4 and 6 months of age although the first dose can be given as early as 6 weeks of age. A booster dose is recommended at 4 years but this can be given as early as 3 years and 6 months of age. Immunisation reduces the risk of infection, however the vaccine does not provide lifelong protection and re-infection can occur. Because pertussis immunity wanes over time, many older children and adults are susceptible to infection and can be the source of new infections in infants. For a limited time, free pertussis (dTpa) vaccine is available for all new parents, grandparents and any other adults who will regularly care for infants less than 12 months of age. Free vaccine boosters are also provided in high school as part of the NSW School-Based Vaccination Program.

Sexually transmissible infections

Syphilis

There was a decrease of approximately 30% in infectious syphilis notifications for NSW in 2010 compared to 2009. A total of 379 cases of infectious syphilis were reported in NSW up until the end of December 2010 compared to 533 cases notified during 2009. The majority of notifications occurred in males aged between 20 and 50 years of age, which is consistent with previous trends.

Syphilis is a highly infectious sexually transmitted disease that is spread through vaginal, anal or oral sex through skin-to-skin contact. Syphilis is highly contagious during the primary and secondary stages when the sore or rash is present. Those most at risk include men who have sex with men, people with HIV/AIDS, and people living in Aboriginal communities that are remote or have poor access to health care services.

Lymphogranuloma venereum (LGV)

An increase in lymphogranuloma venereum (LGV) notifications was reported in NSW in 2010. A total of 50 cases were reported to NSW Health from January to October 2010. The increase may have been due in part to increased screening and case detection following alerts to local clinicians. The number of reports dropped in November and December 2010, with only three cases reported.

LGV is a sexually transmitted infection. It is caused by a rare, severe strain of chlamydia which generally causes more severe symptoms than chlamydia. Around 3–30 days after exposure, a small painless lump or sore appears on or in the penis, rectum, vagina, cervix or mouth. The initial lesion heals after a few days and most people are not aware of it. Over the next 2–6 weeks the infection spreads to the local lymph glands usually in the groin or inside the pelvis. People may also have fever, chills, weight loss, feel generally unwell or have sore muscles and joints. Where the infection is around the rectum there can be a discharge of blood, pus or mucus from the anus, a painful urgent feeling of needing to pass a bowel motion but being unable to do so, diarrhoea or constipation, and lower abdominal pain. LGV is spread through unprotected vaginal, anal or oral sexual contact. It can also be spread through sharing of sex toys between partners.

Figure 1. Reports of selected communicable diseases, NSW, January 2004 to December 2010, by month of onset.
Preliminary data: case counts in recent months may increase because of reporting delays.
Laboratory-confirmed cases only, except for measles, meningococcal disease and pertussis.
BFV, Barmah Forest virus infection; RRV, Ross River virus infections; lab conf, laboratory confirmed;
Men Gp C and Gp B, meningococcal disease due to serogroup C and serogroup B infection;
other/unk, other or unknown serogroups.
NB: Multiple series in graphs are stacked, except gastroenteritis outbreaks.
NB: Outbreaks are more likely to be reported by nursing homes & hospitals than by other institutions.

NSW Population	
Male	50%
<5 y	7%
5–24 y	27%
25–64 y	53%
65+ y	13%

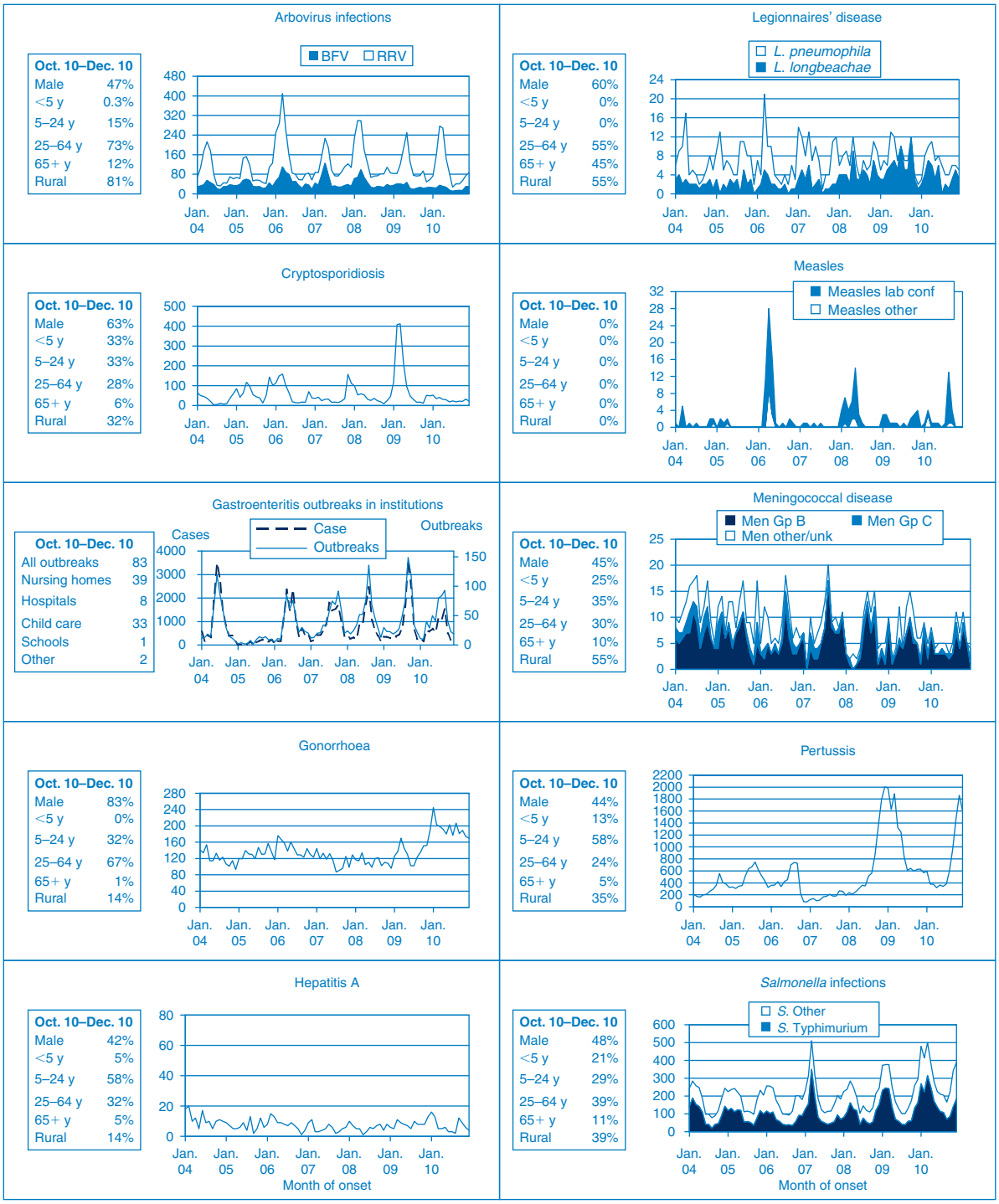

Table 1. Reports of notifiable conditions received in November 2010 by area health services

	Area Health Service (2010)																		Total	
	Greater Southern		Greater Western			Hunter New England		North Coast		Northern Sydney Central Coast		South Eastern Sydney Illawarra		Sydney South West		Sydney West			For	Year
Condition	GMA	SA	FWA	MAC	MWA	HUN	NEA	MNC	NRA	CCA	NSA	ILL	SES	CSA	SWS	WEN	WSA	JHS	Nov[b]	to date[b]
Bloodborne and sexually transmitted																				
Chancroid[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Chlamydia (genital)[a]	61	35	17	36	43	155	47	15	92	66	113	83	266	153	152	59	134	12	1563	16 800
Gonorrhoea[a]	1	2	–	–	–	12	–	–	1	4	16	3	60	41	14	6	12	–	174	2169
Hepatitis B – acute viral[a]	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	2	41
Hepatitis B – other[a]	1	4	2	1	2	5	1	–	1	1	16	3	34	45	57	4	61	15	260	2889
Hepatitis C – acute viral[a]	–	–	–	–	–	–	–	–	–	1	–	–	2	–	–	–	–	1	4	44
Hepatitis C – other[a]	12	11	5	5	9	23	4	3	42	16	12	16	44	34	55	14	32	58	402	4510
Hepatitis D – unspecified[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7
Lymphogranuloma venereum	–	–	–	–	–	–	–	–	–	–	–	–	3	1	–	–	–	–	4	51
Syphilis	1	–	3	–	–	–	–	–	–	4	2	2	15	21	6	–	2	–	56	714
Vectorborne																				
Barmah Forest virus[a]	–	2	1	–	1	4	2	1	13	1	–	–	–	–	–	–	–	–	25	230
Ross River virus[a]	16	–	1	4	4	8	3	–	9	1	–	–	–	1	1	–	–	–	48	1011
Arboviral infection (other)[a]	–	–	–	–	–	1	1	–	3	3	12	6	9	1	3	–	1	–	41	180
Malaria[a]	–	–	–	–	–	1	–	–	–	–	1	3	–	2	–	–	1	–	8	105
Zoonoses																				
Anthrax[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Brucellosis[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3
Leptospirosis[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	17
Lyssavirus[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Psittacosis[a]	–	–	–	–	–	1	1	–	–	–	–	1	–	–	–	–	–	–	3	9
Q fever[a]	–	–	–	–	–	6	–	–	1	–	1	–	–	–	–	–	–	–	8	123
Respiratory and other																				
Blood lead level[a]	6	1	–	11	–	2	–	–	–	2	1	–	–	2	–	–	1	–	26	209
Invasive pneumococcal infection[a]	2	3	–	2	–	4	1	–	1	–	7	3	5	3	4	5	2	–	42	475
Legionella longbeachae infection[a]	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	2	37
Legionella pneumophila infection[a]	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	2	36
Legionnaires' disease (other)[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6
Leprosy	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Meningococcal infection (invasive)[a]	–	–	–	–	–	–	–	2	–	–	–	1	–	–	1	1	1	–	6	66
Tuberculosis	–	–	–	–	–	–	–	1	1	–	4	–	7	7	3	1	6	–	31	333
Vaccine-preventable																				
Adverse event after immunisation	–	–	–	–	–	–	–	–	–	–	3	3	2	–	–	1	4	–	14	154
H. influenzae b infection (invasive)[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6
Measles	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	25
Mumps[a]	–	–	–	–	–	–	–	–	–	–	–	1	1	–	1	–	–	–	3	31
Pertussis	84	175	26	20	64	96	21	16	42	39	356	99	210	136	215	93	166	–	1859	7333
Rubella[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9
Tetanus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Enteric																				
Botulism	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cholera[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Cryptosporidiosis[a]	1	1	–	1	1	4	1	–	2	3	4	–	–	1	1	2	–	–	22	323
Giardiasis[a]	11	5	–	2	4	13	3	–	2	4	31	6	26	17	15	7	12	–	174	2149
Haemolytic uraemic syndrome	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Hepatitis A[a]	–	–	–	–	–	–	–	–	1	1	–	1	1	–	–	–	2	–	7	86
Hepatitis E[a]	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	2	15
Listeriosis[a]	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	23
Rotavirus[a]	3	3	–	1	1	10	3	–	3	5	29	10	17	20	12	14	22	–	153	1116
Salmnellosis[a]	3	15	2	1	3	21	7	–	17	7	24	6	33	17	39	16	28	–	240	3368
Shigellosis[a]	–	1	–	–	–	–	–	–	2	–	1	1	2	4	–	–	–	–	11	99
Typhoid[a]	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–	3	35
Verotoxin producing *E. coli*[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14
Miscellaneous																				
Creutzfeldt–Jakob disease	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9
Meningococcal conjunctivitis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2

[a]Laboratory-confirmed cases only. [b]Includes cases with unknown postcode.
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Table 2. Reports of notifiable conditions received in December 2010 by area health services

	Area Health Service (2010)																		Total	
	Greater Southern		Greater Western			Hunter New England		North Coast		Northern Sydney Central Coast		South Eastern Sydney Illawarra		Sydney South West		Sydney West			For	Year
Condition	GMA	SA	FWA	MAC	MWA	HUN	NEA	MNC	NRA	CCA	NSA	ILL	SES	CSA	SWS	WEN	WSA	JHS	Dec[b]	to date[b]
Bloodborne and sexually transmitted																				
Chancroid[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Chlamydia (genital)[a]	59	29	12	31	35	220	54	34	81	68	105	95	280	114	89	50	103	6	1484	18 284
Gonorrhoea[a]	1	–	–	–	–	12	–	2	3	3	11	5	58	36	12	1	12	–	163	2332
Hepatitis B – acute viral[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	41
Hepatitis B – other[a]	4	1	2	–	1	7	3	–	2	–	14	3	31	23	32	5	40	4	174	3063
Hepatitis C – acute viral[a]	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	2	46
Hepatitis C – other[a]	10	8	3	5	10	27	3	9	11	11	16	11	29	25	30	7	23	18	256	4766
Hepatitis D – unspecified[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7
Lymphogranuloma venereum	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	3	54
Syphilis	1	1	4	–	–	1	3	–	–	–	1	1	18	6	1	–	1	–	39	753
Vectorborne																				
Barmah Forest virus[a]	2	1	–	–	–	3	–	2	9	–	–	5	–	–	1	–	1	–	24	254
Ross River virus[a]	21	–	–	6	6	6	3	1	12	–	1	–	–	–	–	–	–	–	56	1067
Arboviral infection (other)[a]	–	–	–	–	–	2	1	–	1	1	4	2	7	2	1	–	1	–	25	205
Malaria[a]	–	–	–	–	–	–	–	–	–	–	6	2	–	–	1	–	3	–	13	118
Zoonoses																				
Anthrax[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Brucellosis[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3
Leptospirosis[a]	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	1	18
Lyssavirus[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Psittacosis[a]	–	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	–	–	2	11
Q fever[a]	–	–	–	–	–	2	2	1	2	–	–	–	1	–	–	–	–	–	8	131
Respiratory and other																				
Blood lead level[a]	4	–	–	3	–	1	–	–	–	–	–	–	1	2	2	–	1	–	14	223
Invasive pneumococcal infection[a]	1	1	–	1	–	2	2	–	1	3	2	–	4	3	5	–	3	–	28	503
Legionella longbeachae infection[a]	–	–	–	–	–	–	–	1	–	–	–	2	1	–	1	–	–	–	5	42
Legionella pneumophila infection[a]	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	37
Legionnaires' disease (other)[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6
Leprosy	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Meningococcal infection (invasive)[a]	–	–	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	–	2	68
Tuberculosis	–	–	–	1	–	–	–	1	–	–	2	–	5	6	1	–	11	–	27	360
Vaccine-preventable																				
Adverse event after immunisation	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	2	–	4	158
H. influenzae b infection (invasive)[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6
Measles	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	25
Mumps[a]	–	–	–	–	–	–	–	–	–	1	–	1	1	1	–	–	–	–	4	35
Pertussis	136	97	11	22	22	111	19	17	26	40	331	109	231	108	160	88	119	–	1648	8981
Rubella[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1	10
Tetanus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Enteric																				
Botulism	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cholera[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Cryptosporidiosis[a]	2	–	1	2	3	2	3	1	–	2	6	–	1	2	3	1	–	–	29	352
Giardiasis[a]	7	1	–	4	3	14	3	–	1	7	29	8	30	15	11	12	9	–	154	2303
Haemolytic uraemic syndrome	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Hepatitis A[a]	–	–	–	–	–	–	–	–	1	–	–	–	1	–	1	–	–	–	3	89
Hepatitis E[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15
Listeriosis[a]	–	1	1	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	4	27
Rotavirus[a]	–	4	–	–	2	11	2	4	3	4	17	4	12	8	5	3	17	–	96	1212
Salmnellosis[a]	16	6	1	1	7	28	14	20	17	9	49	20	52	25	24	10	23	–	324	3692
Shigellosis[a]	1	–	–	–	–	–	–	–	1	1	1	–	7	–	–	–	1	–	13	112
Typhoid[a]	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	36
Verotoxin producing *E. coli*[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14
Miscellaneous																				
Creutzfeldt–Jakob disease	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9
Meningococcal conjunctivitis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2

[a]Laboratory-confirmed cases only. [b]Includes cases with unknown postcode.
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Contents

Special issue: Policy-relevant population health research

Bug Breakfast in the *Bulletin*

Communicable Diseases Report, NSW

NSW PUBLIC HEALTH BULLETIN

The *NSW Public Health Bulletin* is a peer-reviewed journal produced by the NSW Department of Health and indexed in Medline. It has a NSW focus, however, it aims to support the practice of public health more broadly.

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