

Identifying public health competencies for Australian pharmacists: A modified Delphi study

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Abstract

Objective: This study aimed to define a set of competencies for public health-related services and activities for pharmacists in Australia.

Methods: A modified Delphi technique of two rounds was used to gain consensus by public health and pharmacy professionals on a set of public health competency statements for Australian pharmacists.

Results: Delphi panellists agreed on the inclusion of 27 competency statements organised into three domains of health promotion and illness prevention, health protection and population health quality improvement. Competency statements concerning evaluation of services and reflective practice were revised to achieve agreement in the second Delphi round. Examples of practice were included to illustrate application of the competency to practice.

Conclusions: A set of competencies outlining requirements for pharmacists to bring a public health perspective to practice will assist engagement of the pharmacy profession with public health.

Implications for Public Health: As key providers of public health initiatives, it is important for health professionals, including pharmacists, to engage with public health. Identifying competencies required to deliver effective public health will raise awareness of the contribution of pharmacists to public health and inform their education and professional development.

Key words: pharmacy, public health, competency, health promotion, population health, health protection

Introduction

Globalisation, innovations in technology and data use, and the impact of the COVID-19 pandemic have forced rapid changes in the education and practice of health professionals.^{1–3}

Public health skills, such as responding to health inequities and increasing interprofessional practice, are now required competencies of health professionals, including pharmacists.² Pharmacists have key roles in the supply and quality use of medicines,⁴ with the traditional focus for most pharmacists being services to individuals. The association between pharmacy practice and public health commenced in the 1980s when community pharmacies were identified as health practices readily accessible to the public and suitable for the delivery of health promotion and education.^{5,6}

Practising to full scope for the profession has resulted in community pharmacists currently delivering public health services such as vaccination, health screening and illness prevention.^{7–11}

Contemporary pharmacy practice in Australia is underpinned by competency standards,¹² which increasingly refer to public health and the need for pharmacists to contribute to the health of society. However, Australian cross-sectional studies have identified there is limited awareness of the role of pharmacists in public health, within and outside the pharmacy profession.^{13,14} As pharmacists lack clarity on the principles of public health and its application to their practice,^{13,14} defined competencies and standards are a required step to improving the effectiveness of pharmacists' contributions to public health.^{2,14} Internationally, in the United States of America and the United Kingdom, there has been alignment between pharmacy practice frameworks and public health competencies,^{15,16} but this has not occurred in Australia.

This study is one of a series^{14,17,18} examining the relationship between pharmacy practice and public health in Australia, with the aim being the definition of competencies for pharmacists in the provision of

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public health-related activities. The research used a mixed methods approach^{19–21} and followed a six-step model of competency framework development proposed by Batt and colleagues.²² Data collection studies were informed by analysis of key public health^{23,24} and pharmacy¹² competency frameworks and a scoping literature review.¹⁷ Semi-structured interviews with pharmacists, public health professionals and consumers were then conducted with the aim of exploring current perceptions on how pharmacists contribute to public health, competencies required for effective practice and strategies for further development of roles.¹⁴ Interview participants¹⁴ reported that pharmacists require a level of competence in all public health services²³; however, the effectiveness and impact of their contributions are challenged by barriers to implementation such as health policy, regulation of and remuneration for the profession, lack of awareness of pharmacists' skills and knowledge and evidence for pharmacists' services.¹⁴ A survey of 78 Australian practising pharmacists¹⁸ was subsequently conducted in 2022 with respondents primarily from community and hospital pharmacy practice settings. Other pharmacy roles represented included consultant and general practice, academic, government and community health organisation positions. Survey results suggested that, although pharmacists were generally confident in their delivery of public health-related pharmacy services, they were least confident in the services or competencies traditionally viewed as public health practice, such as health promotion, illness prevention or disaster and emergency preparedness.

A draft set of competency statements describing public health-related activity in Australian pharmacy practice was developed using outcomes of the conducted studies, with data integrated through building and merging of results.²⁵ This study aimed to gain consensus from Australian pharmacy and public health professionals on competency statements as a first step in the validation of the competency set.

Method

The study used a modified Delphi technique²⁶ of two rounds to achieve consensus within a group of Australian pharmacy and public health professionals on competency statements describing public health in pharmacy practice. The Delphi technique is a structured iterative process of communication used when knowledge is uncertain^{27,28} and has been used in the health sciences as a consensus-gaining process, including in the development of competencies for pharmacy practice.^{28–31} This study followed published general principles to ensure a systematic approach,^{28,32} with reporting following criteria proposed from the evaluation of Delphi studies.^{27,33}

Development of draft set of competency statements

A draft set of competency statements was developed following exploratory sequential mixed methods research, which included analysis of key Australian public health²⁴ and pharmacy competency frameworks,¹² a scoping literature review,¹⁷ consultation with experts in public health and pharmacy,¹⁴ a survey of practising Australian pharmacists¹⁸ and responses in a conference workshop at the International Social Pharmacy Workshop 2022.³⁴ Data integration through the building and merging of results²⁵ informed the development of the competency statements. Initial development was completed by the principal investigator and subsequently reviewed,

amended and confirmed by all investigators. The draft set of competency statements was organised into three domains (health promotion and illness prevention, health protection, population health quality improvement) and ten sub-domains adapted from public health practice or education competency frameworks,^{23,35,36} and comprised of 27 statements. References contributing to the content of competency statements are detailed in Supplementary Materials [Appendix A](#).

Development of questionnaire

A questionnaire was developed to allow Delphi panellists to rate their level of agreement with the 27 competency statements, using a six-point Likert scale (1=strongly agree, 2=agree, 3=somewhat agree, 4=somewhat disagree, 5=disagree, 6=strongly disagree). Examples of pharmacist practice (in community, hospital, or public health organisations) applicable to the competency statement were given for each statement to increase understanding of how the competency would be implemented in practice. There was opportunity for free text comments after each competency statement. Demographic questions, including profession, practice setting and years of experience were included in the round one questionnaire. The questionnaire was available in electronic format in Qualtrics® survey software and was piloted with one academic pharmacist with public health training for face and content validity, with feedback indicating that no changes were required.

Recruitment of the Delphi panel

The Delphi panel was recruited by purposive and snowball sampling.³⁷ Criteria for the selection of panellists from Australian pharmacy and public health practice included:

- pharmacists and pharmacy profession representatives with awareness of current pharmacy practice and training, and
- public health practitioners or academics with experience in working with, or educating or training health professionals in public health in Australia.

Invitations for participation were sent to pharmacists or public health professionals who had participated in prior phases of the research or were identified through networks of the investigators.^{14,18} Criteria for selection of panellists were ascertained by the investigators by assessment of contributions to the practice of either pharmacy or public health, visible by current or recent roles, publications, or statements of professional interest. Potential panel members were forwarded the study information and consent form, together with a two-page project information sheet outlining the research background, purpose, scope, development and intended uses of the proposed competency set and links to prior publications of earlier research phases.^{14,17} Invited panellists were asked to indicate their consent to participate by return email and advised of the commencement date of Delphi rounds. Additionally, they were asked to identify and forward invitations to professional contacts meeting the selection criteria.

Delphi process

Consenting panellists were emailed the draft competency set and a link for the questionnaire for completion of round one over three weeks. Two reminder emails were sent to participants to encourage completion. Results were analysed and amendments to the

competency set were completed and agreed by all investigators. After four weeks, panellists were emailed a feedback report, including a summary of round one results, an updated competency set, rationale for changes to competency statements not reaching consensus, and a link to the round two questionnaire. Round two was open for three weeks, then extended for an extra two weeks to allow for completion by some panellists.

Data analysis

Results from completed round one questionnaires were entered into a Microsoft 365 Excel® spreadsheet. Consensus was defined *a priori* as 80% or more respondents selecting one of the three Likert scale choices indicating agreement for each statement (1=strongly agree, 2=agree, 3=somewhat agree). The median, as a measure of central tendency, and the interquartile range, as a measure of dispersion, were also calculated. Round two responses were analysed similarly, and results, including an agreed competency set, were prepared. Free text responses to open questions were analysed thematically³⁸ to inform amendments to examples in practice and competency statements not achieving consensus. The finalised competency set is available as Supplementary Materials [Appendix A](#).

Results

The two rounds of the Delphi were administered between July and October 2023. In total, 23 pharmacy and public health professionals participated, with 25 initially expressing interest in participation, 23 participating in the first and 14 participating in the second round. Most panellists were from the pharmacy profession (87%). Almost half of the panellists (48%) had over 20 years of experience in their profession. Academia was strongly represented (83%) as a practice setting, with 57% of panellists indicating they worked in more than one practice setting. Other professional settings (paid or voluntary work) of panellists included the provision of pharmacy services to individuals (e.g. community, hospital), pharmacy management, professional organisations (pharmacy or public health), public health services, research organisations or government departments. Demographic details are outlined in [Table 1](#).

Table 1: Demographic characteristics of Delphi panellists.

Demographic characteristics of Delphi panellists (n=23)		
Profession, n (%) ^a	Pharmacy	20 (87)
	Public health	4 (17)
Years of experience in profession, n (%)	0-5 years	1 (4)
	6-10 years	3 (13)
	11-20 years	8 (35)
	>20 years	11 (48)
Practice setting, n (%) ^a	Delivery of pharmacy services to patients	7 (30)
	Pharmacy management (e.g. hospital or community)	2 (8)
	Public health services	2 (8)
	Academia	19 (83)
	Pharmacy professional organisations	8 (35)
	Public health professional organisations	2 (8)
	Government department	2 (8)
	Research organisation	1 (4)
	Other (community service organisations)	1 (4)

^aMore than one answer possible.

Of the 27 competency statements presented to the Delphi panel, 25 reached consensus at round one. The wording of two statements not achieving consensus was amended to increase alignment with pharmacy practice language. All statements reached consensus on re-presentation, with 16 competency statements reaching 100% agreement in round two ([Table 2](#)). Measures of dispersion of results from the second round displayed equivalent or decreased interquartile ranges for all statements ([Table 2](#)). Other developments to the competency set between the first and second rounds included minor changes in wording to three competency statements, in response to panel comments ([Table 2](#)).

The two competency statements not achieving agreement in the first round were competencies 3.4 and 3.9 in the population health quality improvement domain ([Table 2](#)). Competency 3.4 described evaluating the effectiveness of public health services in pharmacy practice. The panel suggested that, for pharmacists providing services to individuals, these might be described as patient-related outcomes and experiences. Other suggestions noted that evaluation may be difficult in pharmacy settings providing patient services and that rigorous evaluation requires specific knowledge and skills. The investigators amended the wording of the competency statement to 'determine the value and/or effectiveness' of pharmacy services to be more widely applicable to various practice settings, with this change agreed on by 86% of panellists.

The second competency, 3.9, described individual reflective practice. This resulted in diverse comments from panellists, with some stating that it should be an expected component of practice and important for professional development, while others commented that although it would be appropriate for students, practising professionals may find implementation challenging. The investigators replaced the word 'analyse' with 'reflect' and included a phrase on the relationship to professional development to align with the language of pharmacy. Agreement increased to 86%; however, some panellists still indicated that using tools such as reflective journals to implement the competency may be too time-consuming for practising pharmacists, with training also potentially not addressing the influence of individual pharmacists' values and beliefs on their interactions.

Free text responses by panellists included suggestions for clarity of the examples in practice, identified links between competency statements and highlighted areas where there may be barriers to the implementation of competencies. Panellists suggested that examples in practice should include common examples that practising pharmacists could easily relate to, e.g. smoking cessation, health education and promotion, as well as examples to broaden perspectives of what public health encompasses, e.g. screening for social isolation. Health screening was also highlighted by panellists as an example requiring system change to enable effective implementation. Suggestions included collaboration between public health and pharmacy organisations for the implementation of effective and feasible screening services for pharmacists and clear referral paths for pharmacists to use for identified individuals requiring further assessment.

Panellists identified that pharmacists may need further training or experience for the implementation of some competencies. One area acknowledged as being challenging was the response to cultural differences, particularly if individuals presented with multiple factors influencing their life and health. Panellists highlighted the importance of influences such as disability or impairments and identification as an

Table 2: Results of Delphi Rounds one and two.

Domain and Sub-domain ^{2,9}	Competency	Round one			Amended competency	Round two		
		Percentage of Panel in agreement (n=23)	Median	Interquartile range		Percentage of Panel in agreement (n=14)	Median	Interquartile range
1. Health promotion and illness prevention Health needs and priorities Health promotion and illness prevention services	1.1 Respond to the health needs and priorities of the community or population.	96	1.0	1.00		100	1.5	1.0
	1.2 Recognise the presence and causes of health inequalities and disparities, including the impact of socioeconomic determinants of health, in individuals and in populations.	91	2.0	1.50		93	1.0	1.0
	1.3 Respect the cultural and linguistic diversity of individuals and populations and its impact on their health and wellbeing.	96	2.0	1.75		93	1.0	1.0
	1.4 Assist development of health literacy in individuals and populations.	96	2.0	1.00		86	1.5	1.0
	1.5 Support or conduct health screening services.	96	1.0	1.00		100	1.0	1.0
	1.6 Use evidence-based health promotion materials and messages.	96	2.0	1.00		100	1.0	1.0
	1.7 Support and empower people to identify and reach health goals using health and wellbeing education strategies and behaviour change techniques.	96	1.0	1.00		100	1.0	1.0
	1.8 Engage with appropriate communication and interpersonal behaviours to ensure the needs, preferences, values and beliefs of people from diverse cultural and linguistic groups are respected.	91	1.0	1.00	1.8 Engage with appropriate communication and interpersonal behaviours to support patient-centred care, ensuring the needs, preferences, values and beliefs of all people are respected.	93	1.0	0.0
Community Participation	1.9 Identify and direct individuals to relevant local, state and/or national health and community services when needed for their health and wellbeing.	96	2.0	1.00	1.9 Identify and refer individuals to relevant local, state and/or national health and community services when needed for their health and wellbeing.	100	1.0	1.0
	1.10 Support, integrate or participate in community-wide activities and resources that improve the health of individuals, communities and the population.	96	2.0	1.00		100	1.0	1.0
2. Health protection Emergency and disaster	2.1 Lead or contribute to pharmacy and community emergency and disaster prevention, preparation, response and recovery.	91	1.0	1.00		100	1.5	1.0
Environmental health	2.2 Respond to the presence of occupational and environmental determinants of health and their potential impact on individual, community and population health and wellbeing.	91	1.0	1.00		100	1.0	1.0
	2.3 Lead or contribute to environmentally safe and sustainable practices, to optimise the health and wellbeing of individuals, communities and populations.	91	1.0	2.00		100	1.0	0.0
	2.4 Ensure the safe storage, administration and disposal of medicinal products and therapeutic devices.	91	1.0	0.50		100	1.0	0.0

(continued)

TABLE 2. Continued

Domain and Sub-domain ^{7,9}	Competency	Round one			Amended competency	Round two		
		Percentage of Panel in agreement (n=23)	Median	Interquartile range		Percentage of Panel in agreement (n=14)	Median	Interquartile range
Communicable disease	2.5 Contribute to the control of communicable and other infectious diseases in individuals, communities and populations.	96	1.0	1.00		100	1.0	0.0
3. Population health quality improvement Advocacy	3.1 Advocates for responsible health system change to address the health care needs of individuals, target populations and the community.	96	2.0	1.00		100	1.0	1.0
	3.2 Support and advocate for the rights of individuals in the health system.	96	2.0	1.00		93	1.0	1.0
	3.3 Promote and advocate for the pharmacy profession's contribution to the health and wellbeing of individuals, communities and populations.	91	2.0	1.00		93	1.0	1.0
Information	3.4 Evaluate the effectiveness of pharmacy health promotion, illness prevention and health protection services.	78	2.0	1.00	3.4 Determine the value and/or effectiveness of pharmacy health promotion, illness prevention and health protection services.	86	2.0	1.0
	3.5 Support or lead research contributing to the health and wellbeing of populations.	87	1.0	1.00		93	1.0	1.0
	3.6 Interpret and use data and evidence-based information and research to inform practice.	91	2.0	1.00		93	1.0	1.0
	3.7 Use health information technology and digital systems to collect, analyse and communicate individual, health and practice data.	96	1.0	1.00		100	1.0	1.0
	3.8 Contribute to or lead interprofessional collaborative health care team strategies to improve the health of individuals, communities or populations.	91	2.0	1.00		100	1.0	1.0
Leadership	3.9 Analyse own professional strengths and personal skills, values and beliefs to work effectively with others and in teams.	74	2.0	3.00	3.9 Reflect on professional strengths and personal skills, values and beliefs to collaboratively engage with others, work effectively in teams, and foster continuous professional growth.	86	1.5	1.0
	3.10 Ethically manage people and resources to improve health and wellbeing.	91	1.0	1.00		100	1.0	0.0
	3.11 Serve as a role model and mentor in the delivery of pharmacy activities and services for improved population health.	87	1.0	1.00	3.11 Act as a role model and mentor in the delivery of pharmacy activities and services to improved population health.	100	1.0	0.0
Governance	3.12 Engage in local and national health policy development, implementation and assessment.	91	1.0	1.00		93	2.0	1.0

Table 3: Themes and sub-themes of free text responses.

Themes	Sub-themes
Links between competencies	<p>Insight into socioeconomic determinants allows pharmacists to provide optimal public health services that could be delivered within routine pharmacy practice.</p> <p>Undertaking a 'social diagnosis' allows pharmacists to implement strategies to enhance medication management.</p> <p>The importance of a competence may change according to the individual pharmacist's role or setting.</p>
Required training or experience	<p>Understanding how cultural differences affect health participation and how pharmacists can positively influence health outcomes.</p> <p>Training or resources in patient outcomes and evaluation appropriate to pharmacy practice.</p> <p>Planning or resources for disaster or emergency.</p> <p>Awareness of community and social resources.</p>
Barriers to competency implementation	<p>Practical ways or resources for pharmacists to implement competencies e.g. understanding health needs or priorities of populations.</p> <p>Lack of connection or integration of the pharmacy profession to the wider health system e.g. primary health networks, data system linkages or services e.g. referrals for health screening.</p> <p>Time and remuneration for public health services or functions, e.g. motivational interviewing.</p> <p>Differences in implementation between urban and rural/remote practice for some activities, e.g. interprofessional collaboration, support of research</p> <p>Incorporation of practising pharmacists in professional policy and standard development.</p>

Aboriginal or Torres Strait Islander person, or with diverse sex, sexuality, or gender groups, in addition to consideration of ethnic and linguistic diversity. Table 3 outlines the major themes from panellist comments.

Overall, panellists commented that the competency set covered the scope of public health knowledge and skills for pharmacists and captured the importance of essential components of public health, such as influencing societal, economic and environmental impacts on health. Although the relevance of some competency statements may be different for some specific roles (e.g. employee pharmacists), panellists thought most competency statements were achievable for all pharmacists.

Discussion

This Delphi study was a first step towards the validation of a set of competency statements describing the role of pharmacists in public health in Australia. All competency statements gained agreement from expert panellists after two rounds. Consensus on all statements is an important result, indicating there was a consistent understanding between panellists of Australian pharmacy practice in relation to public health. As competency is a fundamental principle underpinning quality health professional education,² an agreed competency set should be used as a base for describing detailed learning outcomes.

The examples in practice prompted most of the free text responses by panellists with suggestions for increased clarity of application to practice and feasibility of implementation. This highlights that less agreement may be evident when considering how competencies can be implemented in practice. Previous Australian research supports this, suggesting that although public health concepts are included in pharmacy standards, pharmacists are unclear about public health

language, their role in contributing to public health and its implementation as part of their practice.^{13,14,39} The final examples in practice are included with the competency set in Appendix A; however, further development of these by a larger number of pharmacy or public health reviewers with diverse roles may be warranted to clearly describe public health practice for Australian pharmacists. As most current pharmaceutical public health literature pertains to the community pharmacy setting,⁴⁰ the inclusion of examples in hospitals and professional or public health organisations is an initial step to the description of practice across the profession.

Competency statements showing the most dissension belonged to the population health quality improvement domain and concerned self-reflection for leadership and evaluating the effectiveness of pharmacy public health services. Both competencies relate to ensuring that quality and improvement cycles are maintained, so considerations for improvement, either on a personal level (self-reflective practice) or a professional level (service evaluation), can be implemented. Consistent self-reflective practice by health professionals has been shown to be associated with positive influences on optimal care.^{41,42} In the pharmacy profession, the implementation of self-reflective skills in education and professional development has trailed that of other health professions,^{41,43} with limited research into the application of reflective practice in pharmacy.⁴¹ However, routine reflective practice is considered to be crucial for health professionals to respond to changing roles and societal demands^{41,43} and is incorporated into Australian public health³⁶ and pharmacy¹² standards, as well as a requirement in planning continuing professional development.⁴⁴ As a competency receiving one of the lower levels of consensus, self-reflection should be explored further in Australian pharmacy practice. Overload of the pharmacy curriculum with technical information and skills has been highlighted as a factor influencing the incorporation of continual reflective practice into pharmacist education,^{41,43} whilst the lack of frameworks or guidance for implementation have also impacted pharmacist education and practice.^{41,43}

The second competency statement receiving the lowest agreement concerned the evaluation of public health services. The benefits and costs of the introduction of health promotion or other public health services into a pharmacy is essential to understand to ensure sustainable delivery, as well as appropriate clinical governance of services.⁴⁵ Previous research¹⁸ has shown that Australian pharmacists have lower confidence in appropriate evaluation of services than in other public health-related competencies and would appreciate training and supporting resources. Additionally, public health-related pharmacy services have been identified as requiring more robust research to advocate for policy and legislative change to the roles of pharmacists.^{46–50} Pharmacy-level data for use by researchers and pharmacy professional or government organisations is essential to contribute to evidence for the effectiveness of pharmacy services.

The inclusion of evaluation as a competency statement highlighted that the professional setting or role of an individual pharmacist may affect required knowledge and skill levels for each competency. As an example in evaluation, a community pharmacist may need basic skills and resources to support understanding of pharmacy operational data or appropriate patient-related outcomes and experience measures,⁵¹ whereas pharmacists responsible for the implementation of new state-wide or national pharmacy programs need enhanced skills.⁵² However, similar to the current Australian pharmacy

competency standards,¹² the set of competency statements was aligned with the view of competency as a dynamic and contextual construct.⁵³ It is designed to be appropriate for all Australian pharmacists for use as a basis for individuals to identify the importance of each competency to their practice. The examples in practice strived to demonstrate the application of competencies, according to practice setting.

The strength of this study was the level of consensus between panellists, confirming the robustness of the mixed methods research and the framework²² used to inform the draft competency set. Agreement with all statements may be attributed to the homogeneity of participants with most panellists reporting an academic role. However, this was expected to ensure the panel was knowledgeable and experienced in the training and development of pharmacists. Demographic data showed that multiple roles were filled by panellists, with 44 practice setting responses from 23 participants (Table 1). Approximately one third of participants delivered pharmacy services to patients with a range of other professional experience represented, including roles in management, professional organisations and public health practice. Initial consensus from experienced professionals is necessary to ensure the competency set is of sufficient quality for review by the Australian pharmacist population. Development would benefit from further involvement of pharmacy professional organisations, and pharmacists and public health practitioners from diverse settings, roles and levels of expertise.

Comprehensive participation by panellists completing questionnaires was evidenced by the volume of qualitative feedback received, adding to the understanding of pharmaceutical public health practice in Australia. The completion rate of the questionnaire from the first to the second round was 61%, with professional commitments potentially impacting participation in the second round. This was comparable with other Delphi studies,^{54,55} however, dropout may have been lessened using retention strategies such as regular personal contact.⁵⁶

The developed competency set was designed to describe the knowledge, skills and attributes required by pharmacists to implement public health approaches in pharmacy practice. Competency statements outline the expected high-level observable actions and do not detail the multiple learning objectives and training experiences required for the achievement of the competence.

Overall, this study contributed to the validation of public health competency statements for Australian pharmacists. Continued development of this competency set by professional organisations and researchers after testing in the real world is recommended.²¹ It is envisaged that a final competency set may be used as a resource for the pharmacy and public health professions by describing how pharmacists engage with public health. Competency statements may be useful in revisions of public health and pharmacy competency frameworks in Australia, and as a resource for education and professional development.

Conclusion

This study has delivered a comprehensive set of competency statements applicable to the provision of pharmaceutical public health for Australian pharmacists. Although it is recognised that the

contribution of pharmacists to public health requires diverse strategies to increase its effectiveness, the definition of a competency set is one step in promoting public health engagement to pharmacists, pharmacy and public health professional organisations, and potential funders and stakeholders. Further research into areas such as implementation and effective training and professional development using the competency set is important to ensure pharmacists develop expertise to equip them for current and future practice that recognises public health concepts and principles that can be incorporated into routine pharmacy practice.

Ethics approval

Ethics approval for the study was granted by the James Cook University Human Research Ethics Committee, Approval number H8816.

Author contributions

Robin Warren: Conceptualisation, Methodology, Formal analysis, Writing - original draft. **Louise Young:** Validation, Writing – review and editing, Supervision. **Karen Carlisle:** Validation, Writing – review and editing, Supervision. **Ian Heslop:** Validation, Writing – review and editing, Supervision. **Beverley Glass:** Validation, Writing – review and editing, Supervision.

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Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.anzjph.2024.100210>.