

REVIEW

Public health competencies for pharmacists: A scoping review

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Keywords

Competence
Global health
Pharmacy
Public health

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Abstract

Background: Pharmacists are increasingly called to integrate population health approaches into their role. Public health knowledge and skills are recommended to be incorporated into the pharmacy curricula and professional development to enable competence of pharmacists in this area. **Aim:** To describe the competencies required by pharmacists to contribute to the public health of populations. **Methods:** A scoping review of peer-reviewed and grey literature discussing competencies in both pharmacy and public health was conducted. Competencies were extracted into a matrix of pharmacy and public health competencies and inductive coding of themes was undertaken. **Results:** Analysis of 58 papers showed important themes of professionalism, communication and collaboration with communities and other health professionals. Pharmacist services providing health promotion, screening and disease prevention should be directed at community needs. Evolution of pharmacy competencies in global health, health informatics and disaster management are current topics. **Conclusion:** A public health perspective in all pharmacy competency domains may assist pharmacists to understand their responsibility in improving the health and wellbeing of communities and ensure the profession has a positive impact on local, national and global health indicators.

Introduction

The health needs of the world's population are changing rapidly, with health professionals facing new challenges and opportunities (Frenk *et al.*, 2010). Population health demands as well as changes in technology, environmental threats and globalisation contribute to the necessity for change in the roles, education and competency of health professionals (Frenk *et al.*, 2010; Fleming & Parker, 2015). In conjunction with the provision of individualised patient-centred care, health professionals are increasingly required to incorporate public health approaches and interventions to improve the health status of communities or populations (Frenk *et al.*, 2010; Zenzano *et al.*, 2011). The COVID-19 pandemic has placed additional demands on health professionals, including pharmacists, to adapt to meet the society's demands (Austin, 2020; Watson *et al.*, 2021). It is within this changing environment that the scope of pharmacy practice is broadening, with pharmaceutical public

health recognised as a role within the profession and demanding a wider set of knowledge and skills for pharmacists (American Public Health Association, 2006; Root & Vaney, 2017). The International Pharmaceutical Federation have recognised 21 broad development goals for the pharmacy profession (International Pharmaceutical Federation, 2020a), with many of the goals embracing public-health focused outcomes.

Pharmaceutical public health is one of the four domains recognised by the International Pharmaceutical Federation's Global Competency Framework Version 2 (International Pharmaceutical Federation, 2020b) and incorporates emergency response, health promotion, and medicines information and advice.

Public health and pharmacy have evolved as separate professions, inferring that there may be foundational public health principles, skills or competencies that may not have been included in pharmacy training for the provision of pharmaceutical public health services (Meyerson, Ryder, & Richey-Smith, 2013). Although

evidence-based preventive public health services such as smoking cessation and weight management delivered through community pharmacies have been found to improve health outcomes (Thomson *et al.*, 2019), further standardised and consistent training may be required for pharmacists to increase effectiveness of services and impact upstream indicators such as health inequity and appropriate access to care (Wenger *et al.*, 2016; Agomo *et al.*, 2018; Thomson *et al.*, 2019). Furthermore, the incorporation of public health concepts, skills and practice-based learning into pharmacy curricula and ongoing professional development has been recommended (Nemire *et al.*, 2010; Eades, Ferguson, & O'Carroll, 2011; Palombi, Kading, & Hayes, 2013; Addo-Atuah, 2014; Strand, Davidson, & Schulze, 2017; Agomo *et al.*, 2018).

Alignment between public health competencies and pharmacy practice frameworks or standards has occurred in the United Kingdom (UK) (Bryson *et al.*, 2014) and the United States of America (USA) (Covvey *et al.*, 2016); however, this work has not been completed in other countries. Australia stands as an example of this, where pharmacy services with a public health focus, involving health promotion, prevention or protection (Dineen-Griffin *et al.*, 2020; Pharmaceutical Society of Australia, 2018) have been developed, based on relevant pharmacy standards.

Consideration of public health competencies may add to the impact and relevance of services. The aim of this scoping review is to describe competencies identified in international literature that will enable pharmacists to effectively contribute to public health, with the view to applying results from the Australian situation. This is important to ensure that global development goals and competencies (International Pharmaceutical Federation, 2020a, 2020b) are applied according to the characteristics of individual countries. The results of the review will be applicable to professional organisations and educators, as evidence on which to base the future alignment of competencies and education, and will be of particular interest to countries where development of pharmaceutical public health is required.

Methods

Scoping review

A scoping review was determined as the ideal form of review process for this topic, as it allowed the collection of a broad overview of the intersection of pharmacy and public health from both peer-reviewed and grey literature (Munn *et al.*, 2018). The review was

undertaken according to the methodology published by the Joanna Briggs Institute (Joanna Briggs Institute, 2015) and reporting followed the PRISMA Extension for Scoping Reviews (PRISMA-ScR) (Tricco *et al.*, 2018).

Definitions

Definitions of terms within the public health field may be used interchangeably and interpreted differently according to jurisdiction, country or discipline (Koplan *et al.*, 2009; Roux, 2016). To assist in selection of papers and clarity of terms, the Global Charter for the Public's Health (Lomazzi, 2016) was used to establish a background reference for defining 'public health'. Public health is considered to comprise of health promotion, prevention and protection as services which are underpinned by the functions of governance, advocacy, capacity and information (Lomazzi, 2016). Additionally, models outlining public health and primary care (Levesque *et al.*, 2013; AAFP Integration of Primary Care and Public Health Work Group, 2015) were used to provide further guidance in considering the difference between individualised clinical care and that which is directed towards populations.

Pharmaceutical public health has been defined as "the application of pharmaceutical knowledge, skills and resources to the science and art of preventing disease, prolong life, promoting, protecting and improving health for all through organised efforts of society" (Walker, 2000, p.340). In this review, a competency is viewed as the knowledge, skills, behaviours and attitudes of a pharmacist that develops through training, education and experience (International Pharmaceutical Federation, 2012). A competency framework is a set of competencies grouped together to allow support of professional performance and development (International Pharmaceutical Federation, 2012).

Search strategy

A search of peer-reviewed and grey literature was conducted between July 2019 and February 2020. Peer-reviewed papers were located by searching the databases Medline (Ovid), Scopus, CINAHL, Informit and ERIC. The search terms used were based on the key words "pharmacy" and "public health" and "competenc*", with MeSH terms and key words adapted for the requirements of each database. Search terms were tested to ensure the identification of appropriate papers (Arksey & O'Malley, 2005). The search strategy for Medline (Ovid) was "Pharmacists" or "Pharmacy" or "Pharmaceutical Services" and "public health" or "Public Health" or "Health Promotion" or "health protection" and "Health Knowledge", "Attitudes", "Practice" or "competenc*"

or “Education”, “Public Health Professional” or “Competency-based Education” or “Education”, “Pharmacy”. Grey literature was searched systematically by using three of Godin *et al*'s suggested searching strategies: grey literature databases, customised Google searches and targeted websites (Godin *et al.*, 2015). Handsearching of articles cited in included papers was conducted for identification of further potential inclusions.

Screening process

Duplicates were removed from the results of the search strategies and the remaining records were screened according to defined inclusion and exclusion criteria (Table I). Title and abstract screening were conducted by the primary investigator, with 25% of titles checked by a second reviewer. Inconsistencies were resolved by discussion and consensus. The primary investigator subsequently screened full text of articles, with 25% checked by the second reviewer. Discussion by all investigators to reach consensus was used when agreement was not reached by two reviewers.

Table I: Inclusion and exclusion criteria

Inclusion criteria
Pharmacy practice or pharmacy training
Public health
Interprofessional activities or topics that included pharmacists or pharmacy students
Description or list of competencies or learning outcomes
Published after the year 2000
Original research articles, expert opinion or review articles
Reports from professional organisations
Competency frameworks relating to elements of pharmaceutical public health practice
Exclusion criteria
Letters to Editor, notes, abstracts or protocols
Descriptions of knowledge or skills in therapeutic or clinical areas
Languages other than English
Competencies or educational outcomes drawn verbatim from included competency frameworks
General competency frameworks (of whole scope of practice) for pharmacists
General competency frameworks for public health
Duplicated publications of studies or competency frameworks

Data charting

Each paper was charted by the primary investigator according to characteristics including: first author, year of publication, country, type of study, level of evidence as defined by Joanna Briggs Institute (Joanna Briggs Institute & University of Adelaide, 2013), pharmacy setting, public health activity or function (Lomazzi, 2016), study objectives, intervention, outcomes and target group (pharmacy or interprofessional). Charting results were confirmed by the second reviewer for 25% of included papers. In accordance with the scoping study methodology, no formal assessment of study quality was completed (Joanna Briggs Institute, 2015). Competencies or learning objectives were mapped into a matrix of Australian pharmacy competencies (Pharmaceutical Society of Australia, 2016) versus Australian public health educational outcomes (Council of Academic Public Health Institutions Australia, 2016). These pre-existing documents were chosen as the references for most representative of pharmacy or public health practice in Australia. Inductive coding of competencies and themes was also undertaken.

Results

A total of 2397 records were identified by the search, with the full text of 317 papers assessed for eligibility. With 259 papers unable to fulfil inclusion and exclusion criteria, a total of 58 were included for analysis in the review. Figure 1 outlines the results of the selection process.

Study characteristics

Included papers were published between 2002 and 2020, with the majority (n=35) originating from the USA. Other countries represented included the UK (n=8), Australia (n=3), and African countries (n=2). Indonesia, Malaysia, Singapore, Canada and Brazil were each represented by one paper, while five were published by international collaborators. Pharmacists were the profession of interest in 39 papers, while 19 referred to multiple health professions. Approximately half (n=32) of the papers pertained to the pharmacy student setting. The development of competencies was described in 20 papers, with the remainder using competencies or objectives in an educational intervention (n=24) or alternatively, discussing competencies as an outcome or theme (n=14). A summary of the papers is outlined in Table II.

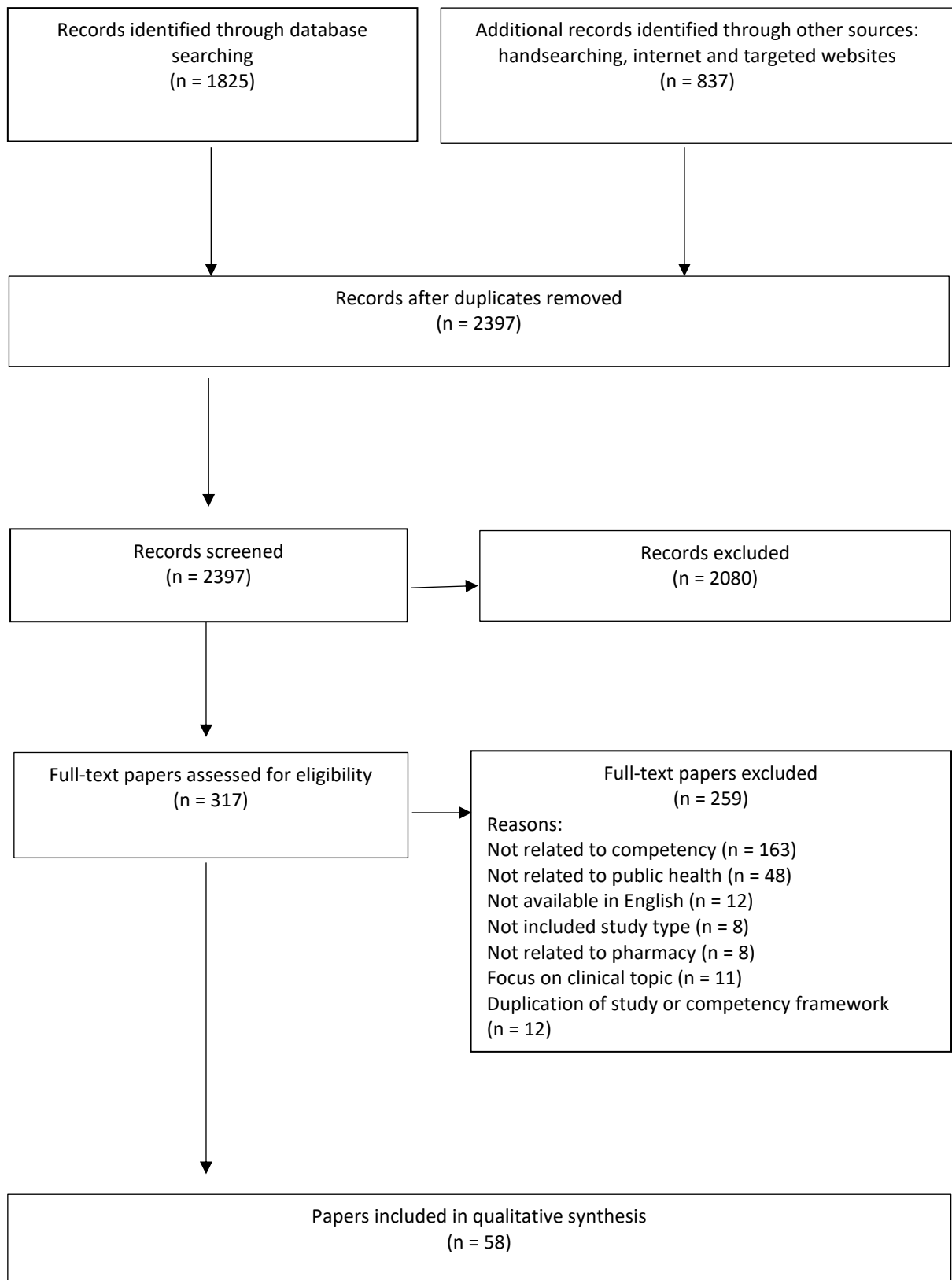


Figure 1: Paper selection process

(Adapted from PRISMA flow diagram (Moher et al., 2009))

Table II: Characteristics of included papers

Authors	Year of publication	Country	Practice setting ^a	Public health services and functions ^c							Objectives	Outcomes	Level of evidence (JBI) ^d	
				Discipline ^b	Health Promotion	Health Prevention	Health Protection	Governance	Information	Advocacy				Capacity
Competency development														
Markenson et al	2005	USA.	S	IP			●					Competencies for terrorism preparedness for all health professionals and applies to medical, dental, nursing and public health professions	Three core competencies (emergency management and preparedness, terrorism and public health emergency preparedness, public health surveillance and response) with a 4th for clinical workers. Levels of knowledge and skill based on Bloom's taxonomy.	M5
Pfleger et al	2008	UK	CP	P	●	●	●	●	●	●	●	Competencies for public health for community pharmacists in Scotland	Consensus in five competency areas - relating to health improvement, quality improvement and ethical management of self.	M5
Mantas et al	2010	International	Any	IP				●	●			Competencies for health informatics to act as a framework for national initiatives	Two levels of three core domains (health informatics core knowledge and skills, health systems organisation, informatics/computer science) and eight optional domains	M5
Fox et al	2011	USA.	S	P					●			Pharmacy informatics skills for the medication use process	Requirements for ability in pharmacy informatics to level tools for care. Number of learning objectives focused around medication-related roles of pharmacists. Health informatics field is dynamic and should be updated constantly.	M5
Walsh et al	2012	International	Any	IP			●					Core competencies for disaster and public health preparedness for all health professionals	11 core competencies, with all having subcompetencies: personal preparedness, knowledge of role, hazard awareness, communication, personal safety measures, surge capacity assets, clinical management in disaster/emergency, management of all ages and populations, ethical and legal principles, recovery for application into education and professional development.	M5
Coleman et al	2013	USA.	Any	IP	●							Health literacy competencies and practices for health professionals	62 out of 64 competencies and 32 out of 33 practices achieved consensus. Separated into knowledge, skill, attitude and practice categories, conforming to Bloom's taxonomy.	M5

^aPharmacy practice setting of relevance (S = student undergraduate or postgraduate, CP = community pharmacy, Other = other pharmacy setting to CP or student, Any = pharmacy practice setting not specified).

^bDiscipline (IP= multidisciplinary or interprofessional setting which includes pharmacy, P = pharmacy only setting)

^cPublic Health Services and Functions according to the Global Charter for the Public's Health (Lomazzi, 2016)

^dM=meaningfulness studies, E=effectiveness studies (Joanna Briggs Institute, 2015)

Table II: Characteristics of included papers

Authors	Year of publication	Country	Practice setting ^a	Discipline ^b	Public health services and functions ^c							Objectives	Outcomes	Level of evidence (JBI) ^d	
					Health Promotion	Health Prevention	Health Protection	Governance	Information	Advocacy	Capacity				
Competency development															
Bzowycykj <i>et al</i>	2013	USA.	S	P								●	Core competencies for effective advocacy of profession for pharmacy curricula	Two competency statements achieved consensus for importance for being an advocate and inclusion in pharmacy curricula, four achieved consensus for either. Three achieved consensus for being an effective advocate - legislative, research and preparation and experience.	M5
Janke <i>et al</i>	2013	USA.	S	P								●	Student leadership development competencies for pharmacy curricula	Consensus reached on 11 competencies in three areas - leadership knowledge, personal leadership commitment and leadership skill development.	M5
NHS	2014	UK	CP	IP		●							Core and technical competences for performing NHS health checks	10 technical competences required for the screening program (programme knowledge, information governance, screening processes (invitation, consent, risk assessment, result interpretation, risk communication), data sharing, intervention/referral, communication with GP.	M5
Royal Pharmaceutical Society	2014	UK	Any	P	●	●	●	●	●	●	●	●	Standards for public health practice for pharmacy based on core areas of public health practice	Professional standards and substandards across nine core areas of practice (surveillance and assessment, public health intelligence, assessment of effectiveness, health improvement, health protection, health and social service quality, policy and strategy, leadership and collaboration, and academic public health). Examples for different practice settings included.	M5
Benzian <i>et al</i>	2015	International	Any	1P	●	●					●	●	Recommendation focused on global oral health education and competencies	Developed and rated for relevance according to four target groups. Three domains - knowledge (oral health, risk factors and determinants), skills and abilities (disease prevention/health promotion, disease management, advocacy, research), supporting competencies and principles (interprofessional, cultural and social, professional ethics).	M5
Jogerst <i>et al</i>	2015	International	S	IP	●	●	●	●	●	●	●	●	Global health core competencies applicable across disciplines	Two levels of competencies - Global citizen 13 competencies across eight domains (global burden of disease, globalisation of health and health care, social and environment determinants of health, collaboration, partnering and communication, ethics, professional practice, health equity and social justice, sociocultural and political awareness. Program-oriented level: 39 competencies across 11 domains.	M5

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					Health Promotion	Health Prevention	Health Protection	Governance	Information	Advocacy	Capacity			
Competency development														
Interprofessional Education Collaborative	2016	USA.	S	IP				●	●			Recommendations for enhanced team-based care and improved population health outcomes	Details within the domain of interprofessional collaboration - values and ethics, roles and responsibilities, interprofessional communication, teams and teamwork.	M5
International Pharmaceutical Federation (FIP)	2016	International	Any	P			●					Guidelines in creation of emergency preparedness plans	Guidance on emergency preparedness in natural disasters or outbreaks, arranged in emergency phases - reduction, readiness, response, recovery.	M5
Covvey <i>et al</i>	2018	USA.	S	P	●	●	●	●	●	●	●	Objectives for a model global health course in a pharmacy curriculum	Development of 20 course objectives arranged in seven domains (global burden of disease, social and environmental determinants of health, ethics, professional practice, health equity and social justice, program management, sociocultural/political awareness)	M5
Johnson <i>et al</i>	2018	USA.	S	P	●				●	●		Competencies for delivery of care to urban underserved patients	Ten competencies developed arranged in four categories (identification of ideals, attitudes and beliefs that benefit urban underserved patients, pharmaceutical and social knowledge base, pharmaceutical care and social skills, awareness of benefits and disadvantages of working with urban underserved patient populations).	M5
National Institute for Health and Care Excellence	2018	UK	CP	P	●	●						Guidelines for pharmacies to maintain and improve people's physical and mental health and wellbeing	Recommendations in six areas to promote health and wellbeing - act as a health and wellbeing hub, adhere to overarching principles of good practice, raise awareness and provide information, offer advice and education, offer behavioural support, and refer and signpost.	M5
Pontefract <i>et al</i>	2019	UK	S	IP				●	●		●	Competence and learning outcomes to work in digital healthcare environment	Six domains of competence (Digital health, Accessing data, Communication, Generating data, Multidisciplinary working, Monitoring and Audit), detailed by 29 learning outcomes for undergraduate healthcare students.	M5
Martin <i>et al</i>	2019	USA.	S	P					●			Informatics competencies to assist curriculum and ensure compliance with standards	High priority competencies - interoperability standards, biomedical informatics, emerging technologies, legal and regulatory, general concepts of safety and computerised physician order entry systems	M3
Association for Prevention Teaching and Research	2020	USA	S	IP	●	●	●	●	●	●	●	Core knowledge for clinical health professionals about individual and population-oriented prevention and health promotion efforts	Framework of four components (Foundations of population health, Clinical preventive services and Health promotion, Clinical practice and Population Health, Health systems and Health policy), divided into 23 domains	M5

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Authors	Year of publication	Country	Practice setting ^e	Discipline ^f	Public health services and functions ^g						Objectives	Outcomes	Level of evidence (JBI) ^h	
					Health Promotion	Health Prevention	Health Protection	Governance	Information	Advocacy				Capacity
Competency use or discussion														
Nichols-English et al	2002	USA	S	P	●							Develop and deliver service -learning and community-based health promotion	Learning objectives included provision of outreach service, working with culturally and linguistically diverse (CALD) groups, working in multidisciplinary teams. Unclear on how the outcomes were collected: Students enjoyed course and were confident in preparing a community outreach program. Learned value of networking and how to use community resources to organise a 'patient-centred ' programme.	E4d
Boyle et al	2004	USA	S	P						●		Implement a leadership and advocacy course	Student participants - achieved goals of learning about political processes, getting involved with health care advocacy, leadership styles and principles.	E4d
Jarvis et al	2004	USA	S	P	●							Design and implement a required service-learning course for first year pharmacy student	Fostered attitudes such as contributing to community, appreciation of different cultures, improved communication and leadership.	E4d
Patterson et al	2008	USA	S	P	●	●						Develop and implement advanced pharmacy practice experience to apply public health concepts	Learning objectives included patient education, cultural competence, interdisciplinary care, health screening, working with underserved population. Means of 3.8-4.8/5 for student assessment of experience and impact on ability	E4d
Maffeo et al	2009	USA	S	P	●	●						Introduce a first year pharmacy student program to teach health promotion, disease prevention and behaviour modification by using the student as the 'first patient'	Evidence of learning and ability for health behaviour change, identification of barriers and mitigation, health status identification, initiation of action plans. 30-40% students indicated the course benefitted other subjects and course work.	E4d
Poirier et al	2009	USA	S	P	●							Develop and implement a course for cultural competency	Overall and all constructs of Inventory for Assessing the Process of Cultural Competence among Healthcare Professionals (IAPCC) showed significant improvement (n=72 - 77) (p<0.001) and showed that students achieved cultural competence	E2d
Crane et al	2010	USA	Any	IP			●					Assess level of preparedness and willingness to respond to bioterrorism of physicians, nurses and pharmacists in Florida	Survey of health professionals. 486 pharmacists (21.3% of respondents), deficits in healthcare providers competency and willingness to respond to bioterrorism. Many not trained.	E4b

^ePharmacy practice setting of relevance (S = student undergraduate or postgraduate, CP = community pharmacy, Other = other pharmacy setting to CP or student, Any = pharmacy practice setting not specified).

^fDiscipline (IP= multidisciplinary or interprofessional setting which includes pharmacy, P = pharmacy only setting)

^gPublic Health Services and Functions according to the Global Charter for the Public's Health (Lomazzi, 2016)

^hM=meaningfulness studies, E=effectiveness studies (Joanna Briggs Institute, 2015)

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Competency use or discussion															
Devraj et al	2010	USA	S	P	●								Implement and assess active-learning exercises in health literacy in improving student knowledge and confidence in a pharmacy course	Learning outcomes included identification of low health literacy, associated behaviours and use of strategies to help patients. Increase in confidence to perform learning outcomes ($p < 0.01$ for most outcomes, $p \leq 0.05$ for one). Knowledge increased from 77.57 - 88.56. Students agreed it increased knowledge.	E2d
Packard et al	2010	USA	S	P	●	●							Implement an elective course to teach screening for CV risk	Learning objectives included skills in Cardiovascular health (CV) screening. Increase in knowledge ($p = <0.001$). Confidence increased in screening and was retained after four months ($p < 0.001$).	E2d
Rutland et al	2010	UK	CP	IP					●				Describe information needs of frontline public health workforce	Pharmacist needed training in effective internet information searching, knowledge of what information is available and targeted bulletins to cut down information overload. Training for all professionals was recognised as IT skills, signposting for information, searching electronic databases.	M3
Saini et al	2011	Australia	S	IP	●						●		Develop implement and evaluate an interprofessional learning module focused on health promotion	Learning objectives included working interprofessionally, team work, health education, recognise effect of policy, No increase in knowledge score, significant improvement in attitudes scale ($p < 0.003$), no change in overall Readiness for Interprofessional Learning Scale Score (RIPLS) but significant improvement in teamwork and collaboration subscale ($p = 0.047$). Students valued opportunity and helped them appreciate public health role and roles of other professionals.	E2d
McCaig et al	2011	UK	CP	P	●	●							Explore community pharmacists' activities and views on providing advice on alcohol use	Low level of service provision. Knowledge and confidence of pharmacists needs boosting to enable effective provision. Least confident in basic skills of public health (e.g. screen, other services, responding appropriately to other situations).	E4b
Abraham et al	2012	USA	Any	IP			●						Develop and implement bioterrorism continuing education for rural health professionals	641 participants - Small number of pharmacist participants (5). Participation in five tabletop scenarios. Positive evaluations from participants. Limitation of small number of pharmacists. Recommendation as key players in exercises as a significant role in threat preparedness and disaster response.	E4d
Haddad et al	2012	USA	S	P	●	●							Implement and assess pharmacy practice experience in community engagement - impact on student confidence and ability to provide community-based services	Learning objectives included collaboration with others, assist community health outreach, deliver health education, practice cultural competency. Significant increase in student competence and confidence - most increase in formulating appropriate care plans for people in community-based outreach programs and skill in delivering educational programs to community.	E2d

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					Health Promotion	Health Prevention	Health Protection	Governance	Information	Advocacy	Capacity				
Competency use or discussion															
DiPietro et al	2013	USA	S	IP	●	●				●			Describe educational opportunities of a worksite health and wellness program	32 undergrad, 17 independent and three pharmacy residents involved. Experiences included health screenings, preparing patient educational material, contributing to marketing and research activities of program. Activities depended on level and experience of student. Student assessment of experience achieved high scores (4.56-4.8/5).	E4d
Chen et al	2013	USA	S	P	●								Evaluate the impact of a health literacy course on student pharmacists	Students learned of challenges, importance and methods of communicating at an appropriate level, difficult to simplify medication related information. Use less complex words, shorter sentences, bullet points, lists, and pictorial options.	E4d
DiVall et al	2013	USA	S	P	●	●				●			Develop, implement and assess a program based on public health outreach to vulnerable populations	260 third year students over two years. Program increased knowledge, awareness of health disparities and ability to influence population health outcomes, interpret epidemiologic data, create education material, implement a public health program, evaluate effectiveness.	E2d
Um et al	2013	Australia	CP	P	●								Among two other objectives, identify training requirement for pharmacists to provide weight management services	12 participants. Pharmacist involved in goal setting, support, engage with other health professionals, needs formalised training and skill development. Skills - communication, motivational interviewing, goal setting. Theory - behaviour change.	M3
Dean et al	2014	Canada	Any	IP	●								Discuss methods to increase global impact of health promotion related to Non-communicable diseases by health professionals	Evidence-based template to assess health promotion competencies in professional curricula. Includes behaviour change theory, tools and interventions that can be integrated into practice. Aim of progressing common health promotion competencies.	M5
Strand et al	2014	USA	Any	P	●	●	●	●	●	●	●	●	Identify how pharmacists can support public health by applying public health competencies to their practice	Needs mastery of public health competencies and clarity of role. Social and behavioural science - target issues in community, culturally competent, diversity in workforce, underserved patient, health screening. Health policy and administration - understand broad determinants to allow advocacy, leverage influence through legislative or economic means, work closely with other professions on advocacy but also interprofessional team. Epidemiology - understand own communities. Biostatistics - medication/prescribing trends, etc. Environmental health sciences – e.g. hazardous substances, prioritise health-enhancing products.	M5

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Competency use or discussion														
Bradley <i>et al</i>	2015	South Africa	Other	P				●	●	●	Describe roles and competencies of district and sub-district pharmacists in Cape Town	Five role and five competency clusters identified - professional pharmacy practice, management, leadership, health system and public health, and personal, interpersonal and cognitive competencies.	M3	
King <i>et al</i>	2015	USA	S	P	●			●	●	●	Implement and evaluate a course on contemporary public health issues	Offered over three years, 205 participants. Modules covering health care reform, social determinants, patient safety, ethics/culture, evidence-based medicine, end of life care. 199 completed evaluations showing over 90% of respondents agreed with positive statements about the course. Increased knowledge and ability to evaluate contemporary issues in ethics, social, cultural and governmental spheres in relation to pharmacy practice.	E4d	
Fritsch <i>et al</i>	2016	USA	S	P	●	●				●	Incorporate service components in a four-year pharmacy program in an underserved population to develop leaders and apply public health	Learning objectives included interprofessional collaboration, patient advocacy, problem solving, cultural sensitivity, self-awareness, leadership, professionalism, health education. Activities included health education, screening, health fair, lobbying. Total of over 10000 hours service provided. Student agreement that experience will positively impact patient care ranged from 52 - 90%.	E4d	
Hannings <i>et al</i>	2016	USA	S	P			●				Determine impact of emergency preparedness simulations on student pharmacist performance and perceived competency	Learning objectives included participation in mass dispensing and mass casualty triage. Expanded understanding of pharmacist roles in emergency preparedness.	E2d	
Scott <i>et al</i>	2016	USA	Any	P	●	●	●	●		●	Assess practice of Pharmacists in Iowa and North Dakota in terms of public health service delivery	Pharmacists in rural areas provided more frequent public health services than those in urban. Most frequently provided services by rural pharmacists: refer people to other health care services, evaluate the pharmacy service, partner with the community and conduct needs assessments. Most common reported service overall comply with pharmacy laws and regulations.	E4b	
Teng	2016	Singapore	Other	IP				●	●	●	Implement a formulary management program in five public healthcare institutions	A systematic framework was developed and tested. Competency development plan introduced in systematic literature search and review, meta-analysis and pharmacoeconomic evaluation. Production of resource guide.	E4d	
Woodard <i>et al</i>	2016	USA	S	P	●	●					Develop and assess impact of course aimed at improving student knowledge and confidence in delivering a group diabetes prevention program	Learning objectives included cultural competence self-awareness, communication for health promotion. No increase in knowledge score, increase in confidence (2.2/5 - 4.2/5, $p < 0.001$). Qualitative feedback - skills learnt included facilitating small groups, diabetes preventions, teaching small group sessions.	E2d	

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Competency use or discussion														
Dare	2017	Australia	CP	P	●							Explore barriers and enablers of influencing community pharmacists' knowledge, confidence, willingness and practice in discussing alcohol-related health	One theme of professional attributes, discussing role adequacy, skill and confidence. Limited skills in non-confrontational communication techniques. How to access and apply relevant alcohol-related health information to manage situations and contexts. Limited knowledge of support and referral services. Needed training on how to use health promotion materials to maximise use.	M3
Kim et al	2017	USA	Any	IP		●					●	Implement a course in critical event response to improve interprofessional team communication	Learning objectives included responding to critical events, using appropriate communication, understand role in team. Improvement in skills. Contributing to team ($p<0.01$), facilitating communication ($p<0.001$), working with teams ($p=0.01$). Improvements in delegation, planning and conflict resolution not statistically significant. Qualitative evaluation showed positive response.	E2d
Kristina et al	2018	Indonesia	S	P	●							Implement and evaluate a health promotion course	Knowledge of health promotion domains (health promotion concepts, community analysis and targeted assessment, programme planning and development, implementation, evaluation) all increased significantly ($p<0.001$). Self-efficacy across nine scales also increased significantly ($p<0.001$).	E2d
Vardanyan et al	2018	Brazil	Other	P		●						Describe core competencies for pharmacists working in humanitarian interventions	Core competency framework based on the interviews and pharmacy/humanitarian competencies was recommended. Findings included the importance of personal skills. Pharmacists spent a majority of time focused on product supply and management, with little time for management of effective medication therapy.	M3
Diaz-Cruz et al	2019	USA	S	P	●						● ●	Approaches for pharmacists to help reduce disparities and inequities in health care	Pharmacy programs include new teaching approaches to help pharmacists provide access to quality health care and advocate for public health solutions. Change from awareness strategies (e.g. cultural sensitivity) to recognition of social determinants and appropriate action and advocacy.	M5
Earl et al	2019	USA	S	P	●							Evaluate impact of a redesigned health literacy module, compared to previous version	Learning objectives included awareness and identification of low health literacy and strategies for improvement. Redesigned course showed modest improvement in students' health literacy skills (statistically significant improvements for some factors and domains $n = 38$). Positive feedback from students.	E2d

Table II: Characteristics of included papers

Authors	Year of publication	Country	Practice setting ^e	Discipline ^f	Public health services and functions ^g							Objectives	Outcomes	Level of evidence (JBI) ^h	
					Health Promotion	Health Prevention	Health Protection	Governance	Information	Advocacy	Capacity				
Competency use or discussion															
Hager <i>et al</i>	2019	USA	S	IP	●							●	Evaluate effective of interprofessional activity for medical and pharmacy students in problem solving in role of social determinant in opioid abuse and misuse	Learning objectives included interprofessional collaboration and awareness of influence of social determinants. Increase in all learning objectives associated with Interprofessional Collaborative Competency Attainment Survey (ICCAS) (p<0.001). Increase understanding of role of social determinants of health (SDOH) and value of interprofessional collaboration.	E4d
Holden <i>et al</i>	2019	UK	CP	P	●								Describe training for pharmacies to be Healthy Living Pharmacies and pharmacists to be Health Champions	Training objectives include running effective health promotion and outreach in community. Feedback is positive with participants becoming motivated and having a plan to implement for the health and wellbeing of their local population.	M5
Law <i>et al</i>	2019	Africa	S	P	●	●			●		●		Explore KAP of student pharmacists about public health in Namibia, Zambia and Zimbabwe	Pharmacists not being utilised for public health activities, responsibility to contribute to disease prevention and health promotion. Informing, educating and empowering people about health, research and innovations, enforcing laws and regulation to protect health and safety.	E4b
Lee	2019	Malaysia	S	P	●	●							Develop and assess a health education campaign and determine potential for integration into curriculum	Learning objectives included development and conduct of health campaigns, communication of evidence, High level of professional achievement and satisfaction, Enhanced critical thinking skills and cultural understanding. No evaluation of students.	E4d
Little <i>et al</i>	2019	USA	Any	P							●		Describe ASHP's position on recommending that all pharmacists have a professional obligation to advocate on behalf of patients and the prevention	Advocacy is professional obligation within and outside profession, in community and society to impact health of communities as a whole. Pharmacist advocates should be trained.	M5

Topics of included papers

Public health competencies for pharmacy were described by two competency frameworks developed in the UK (Pfleger *et al.*, 2008; Bryson *et al.*, 2014) and were discussed broadly by one paper from the USA (Strand & Miller, 2014). Other papers referring directly to public health for pharmacists presented public health modules for pharmacy students (Patterson, 2008; King & Egras, 2015), assessed public health service delivery by pharmacies, (Scott *et al.*, 2016) and discussed the information needs of health professionals delivering public health services (Rutland & Smith, 2010).

Elements of public health practice such as inclusion of social determinants of health (Hager *et al.*, 2019), addressing health inequity (Diaz-Cruz, 2019; Little *et al.*, 2019), caring for vulnerable populations (DiVall *et al.*, 2013; Fritsch *et al.*, 2016; Johnson & Traynor, 2018) and providing humanitarian assistance (Vardanyan, Mosegui, & Miranda, 2018) were also addressed. Other topics represented in papers included health promotion or disease prevention (including health literacy) (n=22) (Nichols-English, White, & Brooks, 2002; Jarvis *et al.*, 2004; Maffeo *et al.*, 2009; Packard *et al.*, 2010; Devraj *et al.*, 2010; McCaig, Fitzgerald, & Stewart, 2011; Saini *et al.*, 2011; Chen, Noureldin, & Plake, 2013; Coleman, Hudson, & Maine, 2013; Um *et al.*, 2013; DiPietro *et al.*, 2013; NHS Health Check national competency and training working group, 2014; Dean *et al.*, 2014; Woodard *et al.*, 2016; Dare *et al.*, 2017; Kristina, Yulianto, & Prabandari, 2018; National Institute for Health and Care Excellence, 2018; Earl *et al.*, 2019; Holden & Evans, 2019; Healthy People Curriculum Task Force, 2020; Law *et al.*, 2019; Lee, 2019), disaster and emergency responses (n=7) (Markenson, DiMaggio, & Redlener, 2005; Crane *et al.*, 2010; Abraham *et al.*, 2012; Walsh *et al.*, 2012; Hannings *et al.*, 2016; International Pharmaceutical Federation, 2016; Kim *et al.*, 2017), community-based services or engagement (n=5) (Haddad *et al.*, 2012; DiVall *et al.*, 2013; Fritsch *et al.*, 2016; Johnson & Traynor, 2018; Diaz-Cruz, 2019), global health (n=4) (Benzian *et al.*, 2015; Jogerst *et al.*, 2015; J. R. Covvey & Ryan, 2018;), health informatics (n=4) (Mantas *et al.*, 2010; Fox *et al.*, 2011; Martin *et al.*, 2019; Pontefract & Wilson, 2019), leadership and advocacy (n=4) (Boyle, Beardsley, & Hayes, 2004; Bzowyckj & Janke, 2013; Janke, Traynor, & Boyle, 2013; Little *et al.*, 2019), policy, planning or management topics (n=2) (Bradley, Lehmann, & Butler, 2015; Teng *et al.*, 2016), cultural competency (n=1) (Poirier *et al.*, 2009) and interprofessional practice (n=1) (Interprofessional Education Collaborative, 2016). All services and functions of public health (Lomazzi, 2016) were represented, with health promotion the most common, being discussed in 37 of the 58 papers. The public health functions of capacity (n=11) and governance (n=13) were least represented.

Relevance to pharmacy and public health frameworks

Competency statements from papers were mapped into a matrix of pharmacy and public health competencies. The results in terms of numbers of papers is provided in Figure 2 for those describing competency development, while Figure 3 shows results for the remaining papers which used or discussed competencies.

Papers presenting competency frameworks included competencies from all pharmacy domains and public health practice areas, while two intersections of matrix elements (communication/professional public health practice and medicines management/health promotion) dominated the results for papers using or discussing competencies. Results from the thematic analysis were then grouped according to the five Australian pharmacy competency domains: professionalism and ethics, communication and collaboration, medicines management and patient care, leadership, and education and research (Pharmaceutical Society of Australia, 2016). A summary of the major themes and areas of competency is outlined in Table III.

Professionalism and ethics

Competency statements contributing to the first pharmacy domain of professionalism and ethics discussed the roles and professional qualities of pharmacists, partnership with people and the communities in addition to understanding and applying policy as well as legislation relevant to practice.

Roles and professional qualities

Competencies in upholding professionalism were described (Pfleger *et al.*, 2008; Walsh *et al.*, 2012; Bzowyckj & Janke, 2013; Bryson *et al.*, 2014; Benzian *et al.*, 2015; J. R. Covvey & Ryan, 2018; Law *et al.*, 2019). The display of professional and ethical behaviour, leadership, respect and understanding for others were described as important foundational attributes for pharmacists in public health roles (Walsh *et al.*, 2012; Bzowyckj & Janke, 2013; Bryson *et al.*, 2014; Benzian *et al.*, 2015; Bradley *et al.*, 2015; J. R. Covvey & Ryan, 2018; Johnson & Traynor, 2018;). The competencies identified required pharmacists to be confident of their role and scope of practice (Bradley *et al.*, 2015; Interprofessional Education Collaborative, 2016; Kim *et al.*, 2017; J.R. Covvey & Ryan, 2018). This attribute, together with an understanding of other health professionals' roles, can enhance professional respect and the conduct of interprofessional activities (Crane *et al.*, 2010; Benzian *et al.*, 2015; Jogerst *et al.*, 2015; Hager *et al.*, 2019; Interprofessional Education Collaborative, 2016; Kim *et al.*, 2017; Saini *et al.*, 2011).

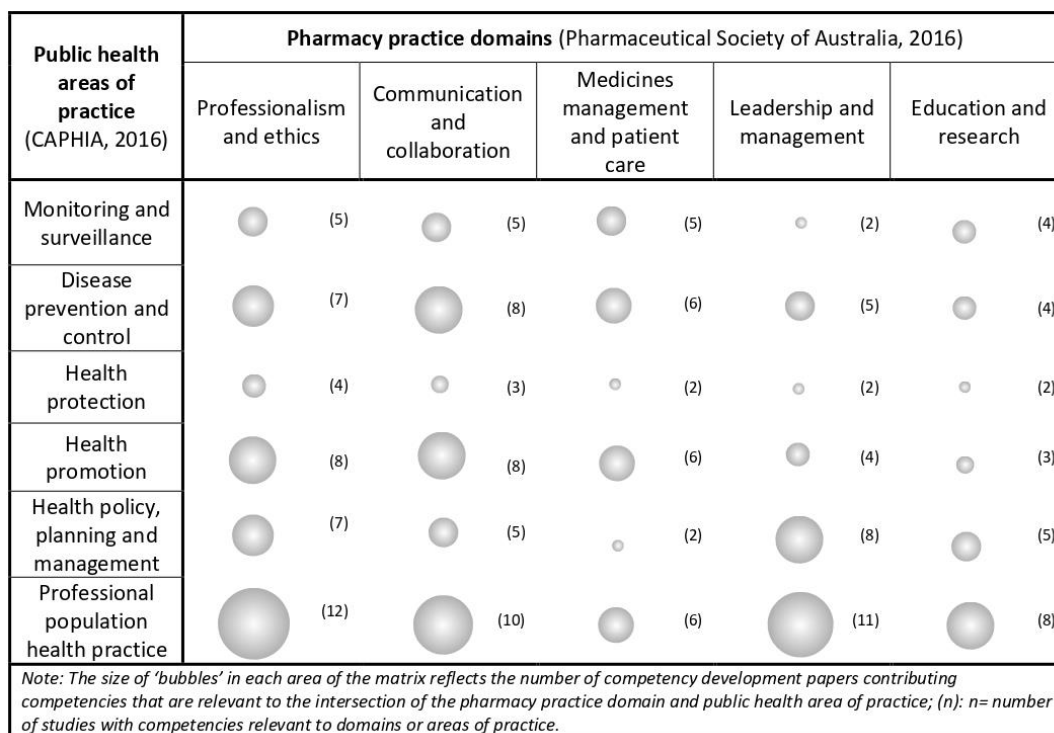


Figure 2: Numbers of competency framework papers containing competency statements according to pharmacy practice domains and public health areas of practice

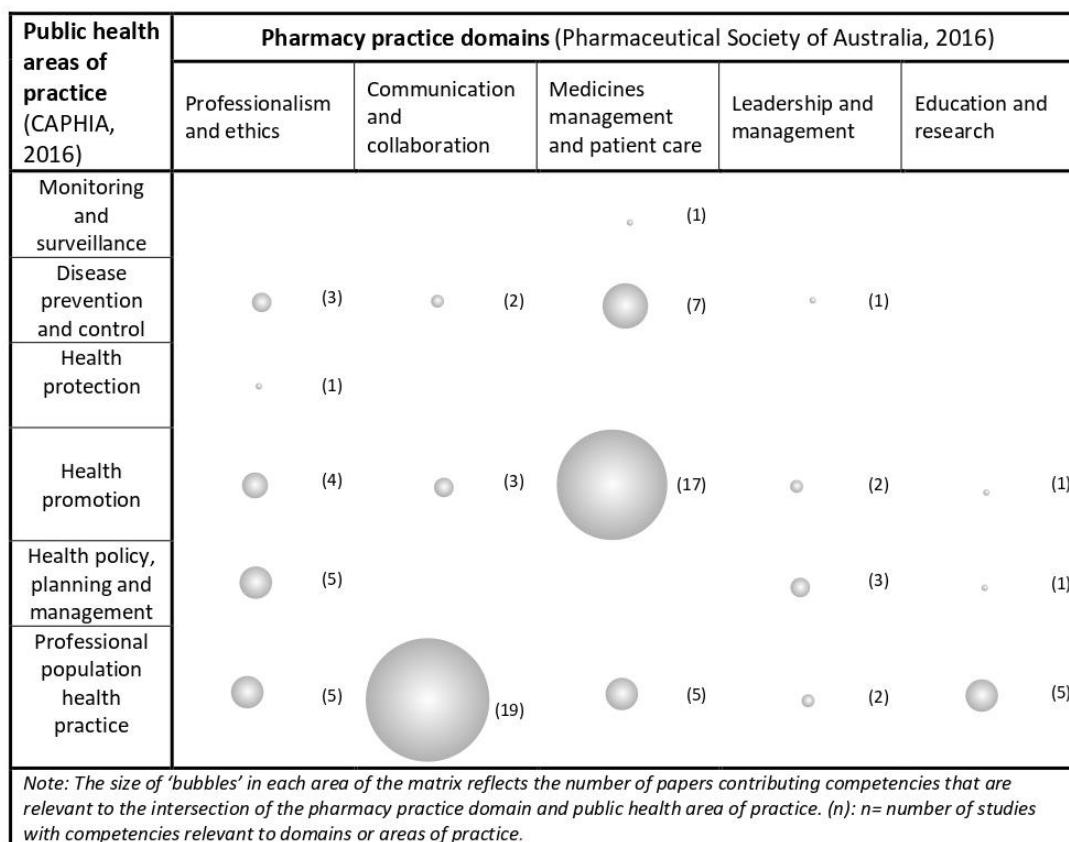


Figure 3: Numbers of papers describing or using competencies containing competency statements according to pharmacy practice domains and public health areas of practice

Table III: Major themes and areas of competency

Competency Domain	Theme	Summary of competencies	References
Professionalism and ethics	Roles and professional qualities	Confidence in role and scope of practice	NHS,(2014), Dare <i>et al.</i> ,(2017), Walsh <i>et al.</i> ,(2012), Markenson <i>et al.</i> ,(2005), International Pharmaceutical Federation,(2016), Hannings <i>et al.</i> , (2016), Mantas <i>et al.</i> , (2010), Boyle <i>et al.</i> ,(2004), Bradley <i>et al.</i> ,(2015)
		Leadership, ethical principles and respect for others	Pharmaceutical Society of Australia,(2016), Diaz-Cruz,(2019), Johnson & Traynor,(2018), Vardanyan <i>et al.</i> ,(2018), Devraj <i>et al.</i> ,(2010), DiPietro <i>et al.</i> ,(2013), Dare <i>et al.</i> ,(2017), Crane <i>et al.</i> ,(2013), Hannings <i>et al.</i> ,(2016), Kim <i>et al.</i> ,(2017), Haddad <i>et al.</i> ,(2012), Martin <i>et al.</i> ,(2019), Bradley <i>et al.</i> ,(2015)
	Partnership with community	Contribution to community	Bryson <i>et al.</i> ,(2014), Pflieger <i>et al.</i> ,(2008), King & Egras,(2015), Diaz-Cruz,(2019), Little <i>et al.</i> ,(2019), NHS,(2014), Dean <i>et al.</i> ,(2014), Hannings <i>et al.</i> ,(2016), Kim <i>et al.</i> ,(2017), Bradley <i>et al.</i> ,(2015), Teng <i>et al.</i> ,(2016)
		Impact of socioeconomic determinants of health	Bryson <i>et al.</i> ,(2014), Covvey <i>et al.</i> ,(2016), Rutland & Smith,(2010), Diaz-Cruz,(2019), Johnson & Traynor,(2018), NHS,(2014), Lee,(2019), Dean <i>et al.</i> ,(2014), Hannings <i>et al.</i> ,(2016), Kim <i>et al.</i> ,(2017), Haddad <i>et al.</i> ,(2012), Benzian <i>et al.</i> ,(2015)
		Consideration of community needs	Bryson <i>et al.</i> ,(2014), Pflieger <i>et al.</i> ,(2008), King & Egras,(2015), Diaz-Cruz,(2019), NHS,(2014), Chen <i>et al.</i> ,(2013), Kristina <i>et al.</i> ,(2018), Hannings <i>et al.</i> ,(2016), Kim <i>et al.</i> ,(2017), Haddad <i>et al.</i> ,(2012)
	Policy and legislation	Compliance with legislation	Bryson <i>et al.</i> ,(2014), King & Egras,(2015), Jarvis <i>et al.</i> ,(2004), Dare <i>et al.</i> ,(2017), Law <i>et al.</i> ,(2019), Covvey & Ryan,(2018), Benzian <i>et al.</i> ,(2015), Boyle <i>et al.</i> ,(2004)
		Participation in policy processes	Bryson <i>et al.</i> ,(2014), Pflieger <i>et al.</i> ,(2008), King & Egras,(2015), Hager <i>et al.</i> ,(2019), NHS,(2014), Covvey & Ryan,(2018), Fox <i>et al.</i> ,(2011), Mantas <i>et al.</i> ,(2010)
		Advocacy	King & Egras,(2015), Hager <i>et al.</i> ,(2019), Johnson & Traynor,(2018), NHS,(2014), Haddad <i>et al.</i> ,(2012), Fox <i>et al.</i> ,(2011), Mantas <i>et al.</i> ,(2010), Teng <i>et al.</i> ,(2016)
	Communication and collaboration	Communication skills and techniques	Skills across all modes of communication
Use of communication techniques to influence behaviour			Bryson <i>et al.</i> ,(2014), Pflieger <i>et al.</i> ,(2008), Diaz-Cruz,(2019), NHS,(2014), Healthy People Curriculum Task Force,(2020), Packard <i>et al.</i> ,(2010), DiPietro <i>et al.</i> ,(2013), Kristina <i>et al.</i> ,(2018), Holden & Evans,(2019), Lee,(2019), Dean <i>et al.</i> ,(2014), Boyle <i>et al.</i> ,(2004), Teng <i>et al.</i> ,(2016)
Interprofessional collaboration		Use of communication techniques based on theory	Healthy People Curriculum Task Force,(2020), Devraj <i>et al.</i> ,(2010), Earl <i>et al.</i> ,(2019), Lee,(2019)
		Use of team approaches	Bryson <i>et al.</i> ,(2014), Pflieger <i>et al.</i> ,(2008), Strand & Miller,(2014), King & Egras,(2015), Johnson & Traynor,(2018), Vardanyan <i>et al.</i> ,(2018), NHS,(2014), Devraj <i>et al.</i> ,(2010), Packard <i>et al.</i> ,(2010), Chen <i>et al.</i> ,(2013), Kristina <i>et al.</i> ,(2018), Holden & Evans,(2019), Um <i>et al.</i> ,(2013), Markenson <i>et al.</i> ,(2005), Crane <i>et al.</i> ,(2010), Abraham <i>et al.</i> ,(2012), Kim <i>et al.</i> ,(2017), Haddad <i>et al.</i> ,(2012), Pontefract & Wilson,(2019), Boyle <i>et al.</i> ,(2004), Bradley <i>et al.</i> ,(2015)

Table III: Major themes and areas of competency

Competency Domain	Theme	Summary of competencies	References
	Cultural competency	Use of strategies that show awareness of and respect for individuals and patient-centredness	Pfleger et al.,(2008), Strand & Miller,(2014), Rutland & Smith,(2010), DiVall et al.,(2013), Fritsch et al.,(2016), NHS,(2014), NICE,(2018), Healthy People,(2020), Maffeo et al., (2009), Devraj et al.,(2010), DiPietro et al., (2013), Hannings et al.,(2016), Janke et al.,(2013), Bradley et al.,(2015), Teng et al.,(2016), Johnson & Traynor,(2018), Holden & Evans,(2019)
		Recognition of own beliefs and behaviours	Rutland & Smith,(2010), Fritsch et al.,(2016), NHS,(2014), Healthy People,(2020), Janke et al.,(2013), Bradley et al.,(2015)
Medicines management	Health promotion and disease prevention	Design, implementation and evaluation of evidence-based health promotion, disease screening or prevention interventions	Bryson et al.,(2014), Pfleger et al.,(2008), Strand & Miller,(2014), Little et al.,(2019), NHS,(2014), Healthy People,(2020), Maffeo et al.,(2009), Devraj et al.,(2010), Packard et al.,(2010), Saini et al.,(2011), DiPietro et al., (2013), Chen et al.,(2013), Earl et al.,(2019), Holden & Evans,(2019), Lee,(2019), Um et al.,(2013), Abraham et al.,(2012), Haddad et al.,(2012), Benzian et al.,(2015), Teng et al.,(2016)
		Health literacy	Identification and improvement of low health literacy by the use of appropriate tools and oral or written strategies
Leadership	Leadership	Self-assessment	Johnson & Traynor,(2018), Kim et al.,(2017), Pontefract & Wilson,(2019), Boyle et al.,(2004), Bradley et al.,(2015)
		Flexible and innovative thinking	King & Egras,(2015), Walsh et al.,(2012), Boyle et al.,(2004)
	Management	Development and management of change	Bryson et al.,(2014), Pfleger et al.,(2008), Fox et al.,(2011), Pontefract & Wilson,(2019), Boyle et al.,(2004), Bradley et al.,(2015)
		Management of programmes, resources and finances, data, quality and risk	Bryson et al.,(2014), Pfleger et al.,(2008), King & Egras,(2015), DiVall et al.,(2013), Vardanyan et al.,(2018), NHS,(2014), NICE,(2018), Kristina et al.,(2018), Jarvis et al.,(2004), Hannings et al.,(2016), Kim et al.,(2017), Covvey & Ryan,(2018), Jogerst et al.,(2015), Benzian et al.,(2015), Martin et al.,(2019), Boyle et al.,(2004), Bzowycykj & Janke,(2013), Bradley et al.,(2015)
Education and research	Education and research	Research or evaluation skills	Bryson et al.,(2014), Pfleger et al.,(2008), Patterson,(2008), Little et al.,(2019), NHS,(2014), Saini et al.,(2011), Chen et al.,(2013), Dean et al.,(2014), Haddad et al.,(2012), Jogerst et al.,(2015), Benzian et al.,(2015), Martin et al.,(2019), Bzowycykj & Janke,(2013)
		Use of data and data systems	Bryson et al.,(2014), Pfleger et al.,(2008), Patterson,(2008), Vardanyan et al.,(2018), NHS,(2014), Jarvis et al.,(2004), Covvey & Ryan,(2018), Jogerst et al.,(2015), Benzian et al.,(2015), Martin et al.,(2019), Bzowycykj & Janke,(2013)
		Provide education, mentoring or coaching	Pfleger et al.,(2008), Strand & Miller,(2014), DiVall et al.,(2013), Jogerst et al.,(2015)

Partnership with community

An overarching theme related to professionalism was the importance of collaboration and interconnectedness for pharmacists. This was discussed at a number of levels with

major concepts being the importance of partnerships with communities and people (Pfleger et al., 2008; Bryson et al., 2014) and the recognition of the impact of societal issues, such as social justice and health equity, on health

(Pfleger *et al.*, 2008; J.R. Covvey & Ryan, 2018; Johnson & Traynor, 2018;). It was identified that pharmacists are responsible for contributing to the community and its health and wellbeing (Jarvis *et al.*, 2004; Pfleger *et al.*, 2008; DiVall *et al.*, 2013; Bryson *et al.*, 2014; Jogerst *et al.*, 2015; Interprofessional Education Collaborative, 2016; Scott *et al.*, 2016; J. R. Covvey & Ryan, 2018; Johnson & Traynor, 2018; Law *et al.*, 2019). The identification of factors that have impact on people's health and pharmacists contribution to community health assessments were described as important to inform appropriate pharmacy interventions (Boyle *et al.*, 2004; Scott *et al.*, 2016; Holden & Evans, 2019; Law *et al.*, 2019).

Policy and legislation

Knowledge and awareness of policy and policy processes was described as required by pharmacists (Boyle *et al.*, 2004; Bryson *et al.*, 2014; Saini *et al.*, 2011; Benzian *et al.*, 2015; Scott *et al.*, 2016; Law *et al.*, 2019; Little *et al.*, 2019). Examples included having an understanding of national and state policies (Saini *et al.*, 2011; Little *et al.*, 2019) and using this knowledge to confidently participate in policy processes and advocacy on national and state issues affecting health (Benzian *et al.*, 2015; Scott *et al.*, 2016; Little *et al.*, 2019), as well as professional activities such as emergency response (Crane *et al.*, 2010).

Communication and collaboration

Competencies identified in the communication and collaboration domain emerged in 32 papers (English *et al.*, 2002; Jarvis *et al.*, 2004; Patterson, 2008; Pfleger *et al.*, 2008; Maffeo *et al.*, 2009; Crane *et al.*, 2010; Nichols-Packard *et al.*, 2010; McCaig *et al.*, 2011; Saini *et al.*, 2011; Haddad *et al.*, 2012; Bzowycykj & Janke, 2013; Coleman *et al.*, 2013; DiPietro *et al.*, 2013; Um *et al.*, 2013; Bryson *et al.*, 2014; Dean *et al.*, 2014; NHS Health Check national competency and training working group, 2014; Bradley *et al.*, 2015; Fritsch *et al.*, 2016; International Pharmaceutical Federation, 2016; Interprofessional Education Collaborative, 2016; Scott *et al.*, 2016; Woodard *et al.*, 2016; Dare *et al.*, 2017; Kim *et al.*, 2017; Johnson & Traynor, 2018; Earl *et al.*, 2019; Holden & Evans, 2019; Law *et al.*, 2019; Lee, 2019; Pontefract & Wilson, 2019; Healthy People Curriculum Task Force, 2020) with a broad range of required communication skills described. Communication skills were identified as being required for working in a culturally appropriate manner with individuals, patient/consumer groups and interprofessionally.

Communication skills and techniques

Communication techniques and strategies to encourage behaviour change, such as brief intervention and

motivational interviewing, were important when working in health promotion or prevention activities with individuals or groups (Jarvis *et al.*, 2004; Pfleger *et al.*, 2008; Maffeo *et al.*, 2009; McCaig *et al.*, 2011; Saini *et al.*, 2011; Um *et al.*, 2013; Bryson *et al.*, 2014; Dean *et al.*, 2014; Bradley *et al.*, 2015; Woodard *et al.*, 2016; Johnson & Traynor, 2018; National Institute for Health and Care Excellence, 2018; Holden & Evans, 2019; Healthy People Curriculum Task Force, 2020).

Awareness of theory as the basis of communication intervention (Maffeo *et al.*, 2009; Dean *et al.*, 2014; Saini *et al.*, 2011; Lee, 2019;) and the importance of non-confrontational communication techniques (Dare *et al.*, 2017; Holden & Evans, 2019) were also discussed. Papers addressing health literacy and advocacy detailed a range of further required communication skills such as the simplification of health information (Coleman *et al.*, 2013; J.R. Covvey & Ryan, 2018) and the ability to produce appropriate written materials (DiPietro *et al.*, 2013; DiVall *et al.*, 2013; Fritsch *et al.*, 2016; Earl *et al.*, 2019). The ability to clearly state key points in health issues, engage with stakeholders and use public relations and marketing methods allows pharmacists to act as advocates for health and also the pharmacy profession (Boyle *et al.*, 2004; Bzowycykj & Janke, 2013; Fritsch *et al.*, 2016). Competencies in communication and collaboration also featured as basic skills for the provision of public health activities such as responses in emergency or disaster situations (Markenson *et al.*, 2005; Walsh *et al.*, 2012; International Pharmaceutical Federation, 2016). Excellence in communication skills was seen as a basis for interprofessional working (Pfleger *et al.*, 2008; Bryson *et al.*, 2014; Interprofessional Education Collaborative, 2016) as well as working with groups of patients, individuals and communities (Bryson *et al.*, 2014; Jogerst *et al.*, 2015).

Interprofessional collaboration

Collaboration with other health professionals was identified as an important aspect of the theme of interconnectedness that appeared in the results. This was reflected in the number of papers addressing interprofessional competencies (n=19) (Markenson *et al.*, 2005; Crane *et al.*, 2010; Mantas *et al.*, 2010; Rutland & Smith, 2010; Saini *et al.*, 2011; Abraham *et al.*, 2012; Walsh *et al.*, 2012; Coleman *et al.*, 2013; DiPietro *et al.*, 2013; Dean *et al.*, 2014; NHS Health Check national competency and training working group, 2014; Benzian *et al.*, 2015; Jogerst *et al.*, 2015; Interprofessional Education Collaborative, 2016; Teng *et al.*, 2016; Kim *et al.*, 2017; Hager *et al.*, 2019; Pontefract & Wilson, 2019; Healthy People Curriculum Task Force, 2020). Of the papers presenting competency frameworks, half (n=10) were directed

towards an interprofessional audience (Markenson *et al.*, 2005; Mantas *et al.*, 2010; Walsh *et al.*, 2012; Coleman *et al.*, 2013; NHS Health Check national competency and training working group, 2014; Benzian *et al.*, 2015; Jogerst *et al.*, 2015; Interprofessional Education Collaborative, 2016; Pontefract & Wilson, 2019; Healthy People Curriculum Task Force, 2020).

Interprofessional practice was specifically addressed in one paper which identified four core competency domains including values/ethics, roles/responsibilities, interprofessional communication and teamwork (Interprofessional Education Collaborative, 2016). Competency sets for an interprofessional target audience were also available in digital health/informatics (Mantas *et al.*, 2010; Pontefract & Wilson, 2019), disaster or emergency preparedness (Markenson *et al.*, 2005; Walsh *et al.*, 2012), disease prevention or health promotion (Coleman *et al.*, 2013; NHS Health Check national competency and training working group, 2014; Healthy People Curriculum Task Force, 2020) and global health (Benzian *et al.*, 2015; Jogerst *et al.*, 2015). To address differing knowledge and skill requirements of professions or roles, several frameworks described levels of required competency attainment (Mantas *et al.*, 2010; Walsh *et al.*, 2012; Benzian *et al.*, 2015; Jogerst *et al.*, 2015) e.g. core, role-specific, discipline-specific and specialised competencies in disaster medicine and public health (Walsh *et al.*, 2012).

Cultural competency

Using appropriate knowledge, skills and attitudes to communicate and practise with cultural appropriateness featured strongly. Attributes outlined included a background awareness and understanding of cultural competence principles (Maffeo *et al.*, 2009; Poirier *et al.*, 2009; Woodard *et al.*, 2016; J.R. Covvey & Ryan, 2018), awareness of the patient as an individual (Jarvis *et al.*, 2004; Johnson & Traynor, 2018; Diaz-Cruz, 2019) and respect for the values of others (Woodard *et al.*, 2016). Recognition of the health beliefs and assumptions that may influence the behaviours of a health professional (Maffeo *et al.*, 2009; Packard *et al.*, 2010) and the ability to modify self-behaviours were also identified as required competencies (Woodard *et al.*, 2016).

Medicines management and patient care

Public health skills of importance in this domain related to participation in health promotion and disease prevention activities. The consideration of health literacy in consumers was also highlighted as important for all pharmacy interactions (Poirier *et al.*, 2009; Chen *et al.*, 2013; Coleman *et al.*, 2013; Bryson *et al.*, 2014;

J.R. Covvey & Ryan, 2018; Vardanyan *et al.*, 2018; Earl *et al.*, 2019).

Health promotion and disease prevention

A broad range of competencies contributing to health promotion and disease prevention featured in this domain. The understanding and awareness of public health concepts underpinning interventions were described as important (Lee, 2019). Examples included basing activity on the social determinants of health (Dean *et al.*, 2014; Diaz-Cruz, 2019) and community need (Benzian *et al.*, 2015; Kristina *et al.*, 2018), awareness and use of theory to explain behaviour change and readiness for change (Jarvis *et al.*, 2004; Maffeo *et al.*, 2009; Um *et al.*, 2013; Dean *et al.*, 2014), awareness of health behaviours (Maffeo *et al.*, 2009), and using concepts of social learning and educating by empowerment (Saini *et al.*, 2011). Skills in the implementation of programs also featured strongly (Jarvis *et al.*, 2004; Haddad *et al.*, 2012; DiVall *et al.*, 2013; Saini *et al.*, 2011; Kristina *et al.*, 2018) and included providing patient education on lifestyle, disease and education (Patterson, 2008; Saini *et al.*, 2011; Haddad *et al.*, 2012; Um *et al.*, 2013; Scott *et al.*, 2016) using appropriate tools, materials and resources (Um *et al.*, 2013; Dare *et al.*, 2017; Lee, 2019).

The role of community pharmacists in referring or signposting patients to appropriate health or other service providers was discussed (Bryson *et al.*, 2014; Dare *et al.*, 2017; National Institute for Health and Care Excellence, 2018; Holden & Evans, 2019). Competencies to ensure pharmacists could design appropriate health promotion, prevention or outreach services (DiVall *et al.*, 2013; Lee, 2019) as well as evaluate them (DiVall *et al.*, 2013; Kristina *et al.*, 2018) were also suggested.

Activities and required competencies directed at community approaches, rather than individual patient care, were described by some papers (Haddad *et al.*, 2012; DiVall *et al.*, 2013; Law *et al.*, 2019). These competencies included skills such as the delivery of appropriate outreach health programs to targeted populations (DiVall *et al.*, 2013), dissemination of public health information (Law *et al.*, 2019) and the delivery of health education incorporating disease prevention or medication-relation information to the community (Haddad *et al.*, 2012).

Health literacy

Competencies in health literacy featured in papers (Poirier *et al.*, 2009; Devraj *et al.*, 2010; Chen *et al.*, 2013; DiVall *et al.*, 2013; Bryson *et al.*, 2014; Earl *et al.*, 2019; Law *et al.*, 2019;) and included identifying the

literacy levels of patients (Devraj *et al.*, 2010; Earl *et al.*, 2019; Law *et al.*, 2019) using health literacy screening instruments (Devraj *et al.*, 2010; Chen *et al.*, 2013;), and employing appropriate oral or written strategies for people with low health literacy (Devraj *et al.*, 2010; Chen *et al.*, 2013; DiVall *et al.*, 2013; Earl *et al.*, 2019). Assessing written health information for appropriateness in low health literacy (Devraj *et al.*, 2010; Chen *et al.*, 2013; Earl *et al.*, 2019) and being able to create appropriate materials or reduce the readability of health information was also required (Devraj *et al.*, 2010; Chen *et al.*, 2013; DiVall *et al.*, 2013; Earl *et al.*, 2019).

Leadership

Competencies in this domain included both leadership and management skills (Pfleger *et al.*, 2008; Fox *et al.*, 2011; Crane *et al.*, 2010; Bryson *et al.*, 2014; Benzian *et al.*, 2015; Bradley *et al.*, 2015; Scott *et al.*, 2016; Teng *et al.*, 2016). Managerial skills included program management (Pfleger *et al.*, 2008; Bradley *et al.*, 2015), using pharmacoeconomic modelling and skills for financial management (Bradley *et al.*, 2015; Teng *et al.*, 2016), data management (Fox *et al.*, 2011), managing quality and risk (Pfleger *et al.*, 2008) and being able to evaluate services in order to implement improvement (Bryson *et al.*, 2014; Bradley *et al.*, 2015). In the global health context, the management of health resources was identified as necessary (Benzian *et al.*, 2015). Leadership competencies described included self-assessment of personal skills (Janke *et al.*, 2013; Bradley *et al.*, 2015; Jogerst *et al.*, 2015; Fritsch *et al.*, 2016; Interprofessional Education Collaborative, 2016), flexible and innovative thinking and being able to provide alternative solutions (Crane *et al.*, 2010; Bradley *et al.*, 2015; Scott *et al.*, 2016).

Education and research

Skills in the education and research domain were described most commonly in the competency frameworks which were broad and comprehensive in nature (Pfleger *et al.*, 2008; Bryson *et al.*, 2014; Benzian *et al.*, 2015; Jogerst *et al.*, 2015; J.R. Covvey & Ryan, 2018; National Institute for Health and Care Excellence, 2018; Healthy People Curriculum Task Force, 2020). The focus revolved around using information and research to understand and develop practice, as well as the evaluation and monitoring of progress across the implementation of activities (Bryson *et al.*, 2014). Research concepts and skills were recognised as necessary for the provision of services (Rutland & Smith, 2010; DiPietro *et al.*, 2013; Teng *et al.*, 2016; Law *et al.*, 2019; Lee, 2019). Skills to assist in information searching (Rutland & Smith, 2010) and communication

(Lee, 2019), design and delivery of programs (DiPietro *et al.*, 2013) and service improvement (DiPietro *et al.*, 2013; Law *et al.*, 2019) ultimately contribute to quality services improving patient satisfaction and outcome (DiPietro *et al.*, 2013). The use of data and data systems is also fundamental as a competency in health informatics (Mantas *et al.*, 2010; Fox *et al.*, 2011; Pontefract & Wilson, 2019). Competency in education and mentoring was addressed from the viewpoint of training other health professionals (Patterson, 2008; Martin *et al.*, 2019) and acting as a mentor or coach (Pfleger *et al.*, 2008).

Discussion

The results of this scoping review provided a broad overview of the competencies required to enable pharmacists to contribute to public health. The inclusion of 58 studies of differing methodologies provided an overview of the skills, knowledge and attitudes considered by professional organisations, experts and educators as important for pharmacists. Approximately one third of included studies were developed frameworks of competencies, two of which directly addressed pharmaceutical public health competencies (Pfleger *et al.*, 2008; Bryson *et al.*, 2014). Published frameworks provided comprehensive descriptions of competencies considered important in pharmaceutical public health generally, but also in particular areas of this field. The inclusion of 38 papers that used or discussed competencies afforded a richer understanding of the issues considered relevant, particularly in the training and education of pharmacists.

This review highlights the importance of public health knowledge and skills contributing to competencies required by pharmacists to practise effectively within their local communities and health systems. Results across all public health areas of practices confirms the importance of systematically mapping the integration of public health strategies to pharmacy practice. Work published in the UK and the USA is confirmed as examples of the broad applicability of public health areas of practice to pharmacy. Other competency frameworks and papers included give detailed information on particular aspects of practice or examples of application in pharmacist training.

Elements of public health practice should be examined in detail to assist pharmacists to be aware of their role in the health of populations. Examples include using public health's traditional knowledge skills in biostatistics and epidemiology as a basis for pharmacists to identify or develop appropriate health

programs for communities (Strand & Miller, 2014). Competency in community engagement and partnership approaches, as well as awareness of health inequities and engagement with vulnerable or underserved people, enable pharmacists to increase the likelihood of positive impacts in population health. Educational programs describing the use of foundational clinical or technical skills in novel public health contexts are examples of ensuring that pharmacy training can move beyond a focus on therapeutics and include skills in putting clinical knowledge into action (Woodard *et al.*, 2018). Important areas for consideration include pharmaceutical public health broadly, as well as considering public health skills in health promotion and disease prevention, interprofessional practice, communication and engagement, and emerging important areas such as global health, health informatics and disaster and emergency response.

Pharmaceutical public health

Competencies or standards directly addressing pharmacy and public health were examined by several papers (Pfleger *et al.*, 2008; Bryson *et al.*, 2014; Strand & Miller, 2014). The development of the earliest pharmaceutical public health competency framework was published in 2008 for community pharmacists in Scotland. Participants in this study considered that some areas of public health practice such as surveillance and policy were not applicable to community pharmacy (Pfleger *et al.*, 2008). However, in contrast, a UK standard published six years later considered that all public health competency areas were applicable to pharmacists, irrespective of practice setting (Bryson *et al.*, 2014). This was consistent with views from the USA that all areas of public health practice are consistent with pharmacy roles (Strand & Miller, 2014). Examples outlined in these papers are illustrations of how pharmacists can apply public health in practice (Bryson *et al.*, 2014; Strand & Miller, 2014).

Health promotion, screening and disease prevention

Competencies around the provision of health promotion and disease prevention featured strongly. This is consistent with the inclusion of health promotion in the role of pharmacists over recent decades (S. Anderson, 2007; Todd, 1993). Papers recommended that health professionals have skills across all programs including the development, implementation and evaluation of activities (Haddad *et al.*, 2012; DiVall *et al.*, 2013; Bryson *et al.*, 2014; Kristina *et al.*, 2018). The support of public health programs by pharmacists should include the awareness of the impacts of social determinants of health and the use of

effective models for interventions in health screening, disease prevention and health promotion (Jarvis *et al.*, 2004; Maffeo *et al.*, 2009; Mantas *et al.*, 2010; DiVall *et al.*, 2013; Bryson *et al.*, 2014; Dean *et al.*, 2014; Benzian *et al.*, 2015; Jogerst *et al.*, 2015; Fritsch *et al.*, 2016; J. R. Covvey & Ryan, 2018; Johnson & Traynor, 2018; Diaz-Cruz, 2019; Law *et al.*, 2019; Healthy People Curriculum Task Force, 2020).

Emerging pharmacy roles

Emerging roles for pharmacists to incorporate into practice include global health (Benzian *et al.*, 2015; Jogerst *et al.*, 2015; J. R. Covvey & Ryan, 2018), health informatics (Mantas *et al.*, 2010; Fox *et al.*, 2011; Martin *et al.*, 2019; Pontefract & Wilson, 2019) and disaster or emergency response (Markenson *et al.*, 2005; Crane *et al.*, 2010; Abraham *et al.*, 2012; Walsh *et al.*, 2012; Hannings *et al.*, 2016; International Pharmaceutical Federation, 2016; Kim *et al.*, 2017).

Global health

The production of global health competency statements over the last five years illustrates the importance now placed on this field of public health (Benzian *et al.*, 2015; Jogerst *et al.*, 2015; J. R. Covvey & Ryan, 2018). Global health training enables pharmacists and other health professionals to be prepared for roles abroad, but also increases skills in practising from a public health perspective, with cultural appropriateness, and to underserved populations (Benzian *et al.*, 2015; Jogerst *et al.*, 2015; J. R. Covvey & Ryan, 2018).

Health Informatics

Health informatics and the related area of working in digital environments are areas in which pharmacists, along with other health professionals, must participate. Basic skills in health informatics allows pharmacists to be able to appropriately access, store and use patient data to inform their practice, as well as practise safely and effectively within a health care team (Mantas *et al.*, 2010; Fox *et al.*, 2011; Martin *et al.*, 2019; Pontefract & Wilson, 2019).

Disaster and emergency response

Disaster or emergency preparedness is an evolving area for pharmacy practice and development (McCourt, Singleton, Tippet, & Nissen, 2020) and is currently a prominent topic, given the spread of COVID-19 across the globe (Watson *et al.*, 2021). Skills across a range of pharmacy competency domains including communication (Mantas *et al.*, 2010; Abraham *et al.*, 2012; International Pharmaceutical Federation, 2016;

Kim *et al.*, 2017), awareness of legal and ethical considerations in response (Abraham *et al.*, 2012; International Pharmaceutical Federation, 2016), resource and personnel management (Crane *et al.*, 2010; International Pharmaceutical Federation, 2016), as well as the application of clinical skills in unique environments were identified (Crane *et al.*, 2010). An underlying tenet of disease or emergency response is for health professionals to be aware of the scope of practice of their own roles (Crane *et al.*, 2010; Hannings *et al.*, 2016; Kim *et al.*, 2017). Emergency preparedness was outlined as operating from the individual, health service and community levels, with pharmacists having responsibilities and roles at all levels (International Pharmaceutical Federation, 2016; Kim *et al.*, 2017).

Professional attributes and interprofessional practice

The framework mapping of competencies showed a strong representation within the professional practice areas of both pharmacy and public health (Figures 2 and 3). This illustrates the importance of underlying knowledge and attributes on which to base clinical skills related to pharmacy and health interventions. Professional competencies allow the pharmacist to practise ethically, legally and cross-culturally (Pfleger *et al.*, 2008; Saini *et al.*, 2011; Walsh *et al.*, 2012; NHS Health Check national competency and training working group, 2014; Benzian *et al.*, 2015; Jogerst *et al.*, 2015; Fritsch *et al.*, 2016; Interprofessional Education Collaborative, 2016; Woodard *et al.*, 2016; J. R. Covvey & Ryan, 2018; Kim *et al.*, 2017; Johnson & Traynor, 2018; Pontefract & Wilson, 2019), recognise professional and personal strengths or weaknesses (Janke *et al.*, 2013; Jogerst *et al.*, 2015; Bradley *et al.*, 2015; Fritsch *et al.*, 2016; Interprofessional Education Collaborative, 2016) and understand their role in health care and the community (Crane *et al.*, 2010; Bzowycyk & Janke, 2013; Abraham *et al.*, 2012; Walsh *et al.*, 2012; Bradley *et al.*, 2015; Hannings *et al.*, 2016; Interprofessional Education Collaborative, 2016; J. R. Covvey & Ryan, 2018; Healthy People Curriculum Task Force, 2020).

Competency in the professional aspects of a health discipline is consistent with being able to work effectively with other professionals. Half of the included competency frameworks in this review were based on competencies for a range of health professions (Markenson *et al.*, 2005; Mantas *et al.*, 2010; Walsh *et al.*, 2012; Coleman *et al.*, 2013; Benzian *et al.*, 2015; NHS Health Check national competency and training working group, 2014; Jogerst *et al.*, 2015; Interprofessional Education Collaborative, 2016; Pontefract & Wilson, 2019; Healthy People Curriculum Task Force, 2020), underpinning the premise that public health approaches across all disciplines are

required. Collaboration amongst the health care team was identified as integral to addressing public health indicators (Patterson, 2008; Pfleger *et al.*, 2008; McCaig *et al.*, 2011; Saini *et al.*, 2011; Abraham *et al.*, 2012; Haddad *et al.*, 2012; Janke *et al.*, 2013; Um *et al.*, 2013; Bryson *et al.*, 2014; NHS Health Check national competency and training working group, 2014; Benzian *et al.*, 2015; Bradley *et al.*, 2015; Jogerst *et al.*, 2015; Fritsch *et al.*, 2016; Interprofessional Education Collaborative, 2016; Scott *et al.*, 2016; Dare *et al.*, 2017; Kim *et al.*, 2017; Kristina *et al.*, 2018; Holden & Evans, 2019; Healthy People Curriculum Task Force, 2020), with communication as the basis for respectful contributions from all professions.

Communication and engagement

Excellence in communication skills was identified as important to a wide range of activities required to address public health. Effective communication is based on psychological and behavioural theory (Maffeo *et al.*, 2009; Saini *et al.*, 2011; Dean *et al.*, 2014; Lee, 2019) and the incorporation of appropriate strategies and techniques to encourage outcomes such as positive behaviour change (Jarvis *et al.*, 2004; Pfleger *et al.*, 2008; Maffeo *et al.*, 2009; McCaig *et al.*, 2011; Um *et al.*, 2013; Bryson *et al.*, 2014; Dean *et al.*, 2014; Bradley *et al.*, 2015; Woodard *et al.*, 2016; Healthy People Curriculum Task Force, 2020; Johnson & Traynor, 2018; Holden & Evans, 2019; Law *et al.*, 2019). This is vital to the implementation of interventions in health promotion, disease screening and prevention. Communication was additionally seen as a base for engagement on a wider level across professions and communities (Pfleger *et al.*, 2008; Bryson *et al.*, 2014; Jogerst *et al.*, 2015; Interprofessional Education Collaborative, 2016) as activities suggested as necessary for ensuring impact beyond individual care (Anderson & Wang, 2016).

Strengths and limitations

Limitations of the review included the restriction to English-only studies. Additionally, terminology used to describe public health and related services e.g. health promotion or health education, is often used interchangeably and interpretation may differ between countries and published literature. Differing interpretations of terms may also have affected the extraction of competencies into public health and pharmacy domains. However, the matrix charting of data was intended to give a broad understanding of the content of published literature.

Papers primarily originated from the USA and UK. The reliance on literature from a small number of countries may limit the diversity of knowledge and approaches in

this topic; however, it is indicative of the health policies and development of pharmacy involvement in public health in these countries (American Public Health Association, 2006; Root & Vaney, 2017). The review purposely did not include studies primarily focussed on a service offered by a pharmacy or pharmacist in specific clinical areas unless there was discussion of non-therapeutic skills or competencies required. Studies discussing pharmacy roles and services in clinical areas comprise the majority of the literature pertaining to pharmaceutical public health and have been the topic of other reviews (Agomo *et al.*, 2018; Buss *et al.*, 2018).

Conclusion

This review was intended to be a broad synthesis of knowledge, skills and attributes that may be important for pharmacists to contribute to modern health systems in the area of pharmaceutical public health. It aimed to describe competencies required by pharmacists and was conducted from the perspective of the Australian health setting.

Competencies in public health were found to be relevant for pharmacists practising in a range of settings. A public health perspective in all pharmacy competency domains assists pharmacists to understand their responsibility to improving the health and wellbeing of communities and populations. A basic level of knowledge and skills considered as public health is required for pharmacists to deliver effective health programs and responsibilities that support and enhance their central role as medication experts. The incorporation of underlying skills traditionally regarded as public health in health screening, health promotion and disease prevention incorporated into the skill sets of pharmacists would be of benefit. This is consistent with international moves to ensure health professionals work as a team and engage with the communities in which they practise. Additionally, the adaptation of health professional roles in line with societal change will require the ongoing involvement of the ability of pharmacists to appropriately participate in areas such as disaster and emergency response, global health and digital health. The requirement for many of these skills to apply to any health professional will see a basic level of competency across all disciplines increase in importance.

The inclusion of public health competencies into undergraduate training and professional development is important to ensure that pharmacists are aware of their responsibilities on a community or population level. Internationally, the extent to which this is

currently available is variable. However, world events, such as natural disasters and the emergence of COVID-19, have highlighted the need that pharmacists are able to respond to public health demands.

This review serves as a first step to engaging with stakeholders, including public health and pharmacy experts, pharmacy academics and educators, and practising pharmacists, to discuss their perspectives on review results, in accordance with their experience (Levac, Colquhoun, & O'Brien, 2010). The findings may serve as a base on which to assess competencies for the pharmacy profession and inform the development of professional curricula in pharmaceutical public health in Australia and other countries in which alignment between pharmacy and public health has not been undertaken. Consideration of core public health skills as attributes for pharmacists enable the effective delivery of health care and ensures that the practice of the profession benefits local, national and global health indicators and achieves development of the profession.

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