Public Health and the CAPE 2013 Educational Outcomes: Inclusion, Pedagogical Considerations and Assessment

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ABSTRACT

The pharmacy profession fills important roles and responsibilities relevant to public health, and therefore, must ensure that student pharmacists are appropriately educated and trained to serve in these essential roles. Public health as a discrete entity is mentioned in the glossary, but not specifically identified within the Center for Advancement of Pharmacy Education (CAPE) 2013 Educational Outcomes. However, specific and critical elements of the science and practice of public health are integrated throughout CAPE 2013. The purpose of this paper is to provide further guidance to the profession on methods to use the CAPE 2013 outcomes to incorporate public health within curricula and in co-curricular programs/activities. This paper will delineate appropriate public health-related course objectives for both didactic and experiential courses. Pedagogical examples and activities such as interprofessional education and co-curricular experiences will be explored, as well as evaluation of learning objective achievement, which can occur through self-assessment, peer-assessment and faculty/preceptor assessment. The pharmacy profession has a unique and critical opportunity and responsibility to contribute to the improvement of health within the community. Student pharmacists must be appropriately educated and trained within Doctor of Pharmacy programs so as to assume and fulfill public health roles and activities.

TEXT

I. Introduction

Public health seeks to maintain and improve the health of individuals, communities, and populations, locally and globally, through research, education, and policy development.[1] Pharmacists and student pharmacists have multiple opportunities to impact public health, from providing healthcare and services such as health education ("micro" level) to planning and overseeing population-based initiatives such as emergency preparedness ("macro" level).[2] Even if student pharmacists do not foresee pursuit of a career in public health at the "macro" level, it is imperative that they realize the potential to impact public health daily at the "micro" level that exists through patient counseling, disease screening, tobacco cessation programs, provision of immunizations, and other activities.[2] Growing recognition exists from many professional and governmental organizations as to the diverse roles for pharmacists in public health. Professional organizations, both within and outside of the profession of pharmacy, have white papers detailing the impact of pharmacy in public health.[2-5] Governmental organizations, including the Centers for Disease Control and Prevention (CDC) and the US Public Health Service (USPHS), also have recently published papers highlighting the important contributions of pharmacists in improving patient-specific and population-based outcomes.[6-7]

For decades, there have been calls for pharmacists to further engage in public health activities and for the academy to better equip student pharmacists for roles in public health.[8] Accordingly, the first set of CAPE outcomes, released in 1994, included public health as one of five areas of professional outcomes.[9] Public health continues to be a focus for pharmacy education, as evidenced by the many current CAPE 2013 outcomes[10] that require knowledge and application of public health theories and models in order to be successfully met. It should be noted that while both CAPE 2013 and the most recent Accreditation Council for Pharmacy Education (ACPE) standards[11] more extensively use the term "population health," it is important to understand that public health is a broader discipline, encompassing population health with a variety of other areas, including but not limited to epidemiology, cultural competence, health promotion, disease prevention and drug safety.

Public health also intersects many professions and benefits from the knowledge, skills and abilities of those professions to deliver our public health infrastructure. Like healthcare delivery, training student pharmacists to understand, appreciate and collaborate with other professions is essential to a curricular approach in public health. The Association for Prevention Teaching and Research (APTR) developed the *Clinical Prevention and Population Health Curricular* (CPPHC) *Framework* in conjunction with the Healthy People Curriculum Task Force.[12] This effort seeks to guide a common set of skills in public health that are relevant across the health professions. Furthermore, the Interprofessional Education Collaborative (IPEC) established in 2011,[13] laid the

groundwork for health professions to learn together and from each other using four core competency domains with specific subdomains to add function while maintaining flexibility. To marry the concepts of public health curriculum with IPEC competencies, the APTR developed the *Advancing Interprofessional Clinical Prevention and Population Health Education: A Curriculum Development Guide for Health Professions Faculty.*[14] This guide provides integrative learning activities with crosswalks between IPEC Core Competencies and the CPPHC elements, and will be a key reference alongside CAPE 2013 for the recommendations in this paper. The purpose of this paper is to provide further guidance to the Academy and profession on methods to use the CAPE 2013 outcomes to incorporate public health within Doctor of Pharmacy (Pharm.D.) curricula.

II. Pedagogical considerations

A. Introduction

The American Association of Colleges of Pharmacy (AACP) Public Health Special Interest Group (SIG) CAPE working group collectively identified the CAPE 2013 outcomes most pertinent to the inclusion of public health within a pharmacy curriculum, including 1.1 (*Learner*), 2.1 (*Patient-centered care*), 2.3 (*Health and wellness*), 2.4 (*Population-based care*), 3.2 (*Educator*), 3.3 (*Patient advocacy*), 3.5 (*Cultural sensitivity*), 3.6 (*Communication*), 4.1 (*Self-awareness*) and 4.2 (*Leadership*). Although independently decided by both groups, eight of these ten identified outcomes were common to those concurrently identified by the AACP Global Pharmacy Education SIG CAPE working group. These outcomes served as the basis for the following discussion on pedagogy, with activities and frameworks mapped to related outcomes in each section.

B. Public health frameworks

As public health is a unique profession onto itself, understanding its relationship within the profession requires examination of the foundation of the field independent of pharmacy. Key curricular guidance for public health within the field itself has been developed by the Association of Schools and Programs of Public Health (ASPPH), through the Masters of Public Health (MPH) Core Competency Model.[15] This framework provides a foundation for development of more relevant guidance on integration of public health into other health professional curricula. The APTR Healthy People Curriculum Task Force, previously introduced, which includes eight member organizations across the health professions (with AACP representing pharmacy professionals), created the CPPHC framework, which provides guidance for "*a common core of knowledge for clinical health professions about individual and population-oriented prevention and health promotion efforts.*"[12] The framework consists of four components, including (1) foundations of population health, (2) clinical preventative services and health

promotion, (3) clinical practice and population health, and (4) health systems and health policy; these components are further broken down into 23 domains.[12]

Also central to this discussion is how public health integrates into accreditation standards for pharmacy education, as guided by ACPE.[11] Several of the required areas in the didactic Pharm.D. curriculum are reflected in public health curriculum.[11] Specific to aspects in the advanced pharmacy practice experience (APPE) curriculum, ACPE expects interprofessional interaction and blended environments, both of which are promoted within the public health curriculum.[11] **Table 1** provides a mapping of the relevant CAPE outcomes related to public health, relevant areas of ACPE Standards 2016 and mappings to external curricular guidance within the field. It is evident that CAPE 2013 integrates significantly with existing subject-specific and generalized frameworks, allowing for achievement of multiple goals for programmatic structure when developing and implementing a public health curriculum in colleges or schools of pharmacy (C/SOPs).

A final framework for consideration is the Ten Essential Public Health Services as defined by the CDC, which guide the activities in public health that communities should pursue in the provision of comprehensive services (**Box 1**).[16] Beyond pharmacy school, pharmacists should be trained and able to contribute to these frameworks as part of a multidisciplinary team, and the CAPE outcomes align and support achievement of these goals. Monitoring health status and investigating health problems are core activities that can be found within patient-centered care (subdomain 2.1), health and wellness (subdomain 2.3) and population-based care (subdomain 2.4). Involvement in essential services such as education (subdomain 3.2), mobilization of action (subdomain 4.2), policy development (subdomain 3.3) and service evaluation (subdomains 3.2, 3.4) also represent logical bridges to basic pharmacy curricula.

Box 1: Ten Essential Public Health Services defined by the CDC[16]

1. Monitor health status to identify and solve community health problems
2. Diagnose and investigate health problems and health hazards in the community
3. Inform, educate, and empower people about health issues
4. Mobilize community partnerships and action to identify and solve health problems
5. Develop policies and plans that support individual and community health efforts
6. Enforce laws and regulations that protect health and ensure safety
7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable
8. Assure competent public and personal health care workforce
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services
10. Research for new insights and innovative solutions to health problems

With these frameworks in mind, it should be noted that the achievement of the CAPE outcomes remain the primary goal of pharmacy education. However, in order to maximize the public health impact of pharmacy contributions, and to prepare student pharmacists to know how that might be done, it is recommended that, where appropriate, the Ten Essential Public Health Services be used to describe ways in which student pharmacists might demonstrate competency in their respective CAPE outcomes. For example, pharmacists are in the hub of the community, but have not been very proactive about "*mobilizing community partnerships and action to identify and solve health problems*" (essential service #4). However, CAPE subdomain 4.2 on leadership could be defined for student pharmacists as including, but not limited to "*mobilizing community partnerships to identify and solve health problems*" as a specific way in which the pharmacist can exert leadership in a way that contributes to public health goals.

The methods by which the CAPE 2013 outcomes can be incorporated within public health coursework will vary greatly according to the broader structure of the C/SOP curriculum in question. It is imperative that public health knowledge meets vertical coherence within the curriculum and is integrated at a level of understanding appropriate for the learners' relative understandings of physiology, medicinal chemistry, pharmacology and therapeutics. Public health additionally opens up the opportunity for horizontal coherence as its foundational lessons apply across a variety of topics relevant to alternate areas of the curriculum, including patient counseling, drug literature retrieval and evaluation, and pharmacy service execution. While a public health professional often approaches clinical care with a population- and service delivery-based view, a pharmacist must integrate both patient-centered and population-centered services depending on the clinical scenario. Therefore, there are restraints on the depth of inclusion of public health curriculum within pharmacy, as one must remain cognizant of the other core competency areas in which a pharmacist must become proficient.

C. Learning objectives in public health

The CAPE 2013 outcomes provide an outline of domains and subdomains as well as examples of learning objectives that might fall under each section. Therefore a list of learning objectives specific to public health were developed. While not meant to be comprehensive or exhaustive, the list may provide guidance on example learning objectives for a Pharm.D. program curriculum that incorporates public health education and is based on the CAPE outcomes. These objectives can be utilized in both didactic and experiential settings, and discussion of how these objectives might be integrated into curricular activities will be discussed later. Learning objectives that student pharmacists should be able to achieve upon completion of a Pharm.D. program curriculum incorporating public health principles/educational tenets consistent with CAPE 2013 outcomes are listed in **Appendix 1**.

D. Didactic curriculum

Current accreditation requirements are quite prescriptive in the Pharm.D. program curriculum. However, as mentioned above, public health education should be a high priority in pharmacy education, evidenced by the presence of public health competencies found cross-cutting the CAPE outcomes. As there are various ways in which public health might be incorporated into the didactic portion of the Pharm.D. curriculum, and a need for consistency in how these principles are represented is essential, an integrated approach on how to accomplish this is presented in **Table 2**. Competencies in public health for didactic curricular inclusion have been amalgamated from relevant sources and organized using the domains of the CPPHC framework;[12] They have been subsequently assigned graded recommendations:

- Grade I: strongly recommended to be included in the curriculum and include concepts from CAPE 2013,[10] ACPE Standards 2016,[11] the JCPP Vision of Pharmacy Practice,[17] and the CPPHC framework[12]
- Grade II: suggested to be included in the curriculum and include concepts from the MPH Core Competency Model[15] for students who may pursue a pathway in public health; this may include competencies that may not be integral for a pharmacy curriculum

Use of this schematic approach may help educators and administrations devise standardized and relevant methods to integrate public health into pharmacy curricula, with outcomes-based focus. However, there are still a number of ways in which this can be delivered. Public health content can be delivered as a stand-alone course, set apart from the rest of the pharmacy curriculum. The advantage of this method is that it allows for public health to be taught from within an explicit theoretical perspective. The disadvantage is that student pharmacists might see the class as an “add-on” which is not relevant to future roles as pharmacists. Therefore, public health also can be delivered as a cross-cutting component of all pharmacy courses. The advantage is that student pharmacists will see the relevance and application of public health to all aspects of pharmacy; however relatively few pharmacy faculty members have training in public health, so it may be difficult or uncomfortable for faculty to deliver public health content in courses in a way that maintains the fidelity of public health as a health science profession. Furthermore, facing time constraints, faculty members will find it difficult to make the public health content a high priority, and public health may receive short shrift in the course. Finally, public health also can be delivered as a cross-cutting domain, but primarily delivered in those courses that have more direct application. Some of the courses most amenable to this approach include: Immunology, Introduction to Healthcare Systems, Drug Literature Evaluation, Infectious Disease, Special Populations and Pharmacy Law. The advantage to this approach is that student pharmacists have multiple opportunities to learn the concepts and skills necessary in public health, and in several different courses. The same disadvantage applies, that these faculty members might not be appropriately trained to deliver public health content. No research has been done comparing these three

approaches; this provides an opportunity to collaborate across C/SOPs to determine the strengths and weaknesses of each approach.

A question for consideration is whether the focus should be helping student pharmacists to incorporate public health skills into pharmacy practice, or whether pharmacists should bring pharmacy skills into public health work. The latter would imply that pharmacists are expected to embrace the theoretical basis of public health as a prerequisite to participation in public health work. Helping pharmacy practice faculty to understand population health, while still teaching the importance of individual patient care, is a challenge, and has implications for faculty and preceptor development. Future research could examine different models of incorporating public health into the curriculum to define an optimum model. In addition to public health content, a public health approach to the utilization of this content and these skills in order to improve population health outcomes is equally critical. Bringing together patient-centered pharmacy (subdomain 2.1) with population-based public health theory (subdomain 2.4) requires a significant paradigm shift.[18]

Didactic education in public health should be delivered in dynamic and participatory ways, so that student pharmacists are deeply engaged in their learning, and perceive the true relevance of public health to pharmacy. Content can be delivered by lecture integrated with focused or generalized case studies, problem sets and activities. Student pharmacists can benefit immensely by hearing guest lectures from practicing pharmacists who are utilizing public health in their work. Content can be used to introduce several public health skills and application through investigation of one pharmacy issue. For example, prescription drug abuse and the current opioid abuse epidemic serves as an exemplar pharmacy-specific public health problem. With this single clinical area, many of the CAPE-related outcomes can be achieved using an integrated approach (**Box 2**).

Box 2: Prescription drug abuse and the current opioid abuse epidemic pedagogical example

- Examine the "who what, where, when and why" of opioid abuse using epidemiology (subdomains 1.1, 2.1)
- Interpret sample data from pharmacy benefit managers on opioid prescribing patterns (subdomain 2.4)
- Analyze reasons underlying opioid abuse and select behavioral change methods that have strong evidence for effectiveness in cessation programs (subdomains 3.2, 3.5)
- Discuss the contribution of health disparities regarding drug and associated techniques in patient advocacy (subdomain 3.3) and cultural sensitivity (subdomain 3.5)
- Address the role of health policy in regulating the prescribing of opioids, including alternative methods of delivery other than injection (subdomains 2.1, 3.5)
- Sponsor a guest lecturer from the DEA or board of pharmacy to discuss opioid regulation (subdomains 4.1, 4.2)
- Role-play pharmacist interventions in patient safety when they may encounter inappropriately or illegally prescribed opioids (subdomain 3.3)
- Develop programs/grants for pharmacist-run public health interventions against opioid abuse (subdomain 2.3)
- Deliver an educational presentation to the public on opioid abuse to build communication skills (subdomain 3.6)

Examples of public health integration

While by no means an exhaustive list, it was thought that the best way to assist pharmacy educators on implementing and delivering public health within a pharmacy curriculum was to provide published examples of methodologies using used by various C/SOPs to achieve these goals.

- At Jefferson College of Pharmacy, an online required course focusing on public health principles in the third professional year, titled *Pharmacy Grand Rounds*, is used to reinforce and build upon public health topics dispersed among other previous coursework.[19] Six learning modules were provided on topics such as healthcare reform, social determinants of health, patient safety and ethics/culture. Success of the course was demonstrated by strong student performance and evaluative feedback, and use of the online format was thought to promote self-led learning.
- Queen's University Belfast School of Pharmacy (United Kingdom) reported the use of debate workshops for second year student pharmacists.[20] Student pharmacist groups were assigned to proposition or opposition of topics including sale of weight loss aids, needle exchange programs, animal research and use of antiretroviral medications in developing countries. Student pharmacists scored highest on research skills, and comparatively lower on rebuttal skills; other skill development reported by student pharmacists included teamwork, communication and critical-thinking.
- Several iterations of a required course in social and behavioral pharmacy for second professional year student pharmacists has been delivered at the University of Illinois at Chicago College of Pharmacy.[21] Broad content areas involve illness and sick roles, medication errors/safety, health behaviors and social interactions. Revisions of the course included use of interprofessional experts to deliver content, alumni panel discussions, sharing of perspectives by real patients, and use of reflective assignments.
- At the Midwestern University College of Pharmacy Glendale, an elective course on pharmacy-based health screenings has been offered, incorporating assignments/workshops with hands-on experience in regulatory issues, general health, osteoporosis, cholesterol, diabetes and blood pressure.[22]
- Faculty at North Dakota State University College of Pharmacy described the use of a public-health poster project completed by third professional year student pharmacist pairs, which were presented at the North Dakota Midwinter Pharmacy Conference.[23] Prior to the project, student pharmacists have received lecture-based instruction in public health topics over four previous semesters integrated into a wider pharmaceutical care course series. Student pharmacists found that the project enhanced their awareness of public health issues and presentation skills.
- The University of the Pacific implemented a longitudinal capstone research project focused on public health early in the curriculum for first professional year student pharmacists.[24] Student pharmacist teams used Healthy People 2010 initiatives to create mock IRBs and survey instruments, and to execute their work over the course of a semester, culminating in a final presentation and paper on the project. Student pharmacists reported high levels of satisfaction with the activity with regards to team work and self-directed learning.

E. Experiential curriculum

Experiential opportunities both during Introductory Pharmacy Practice Experience (IPPE) and APPE offer a wide range of opportunities to further reinforce public health concepts. In the same vein as the competencies produced for didactic inclusion, experiential activities relevant to public health have also been mapped to the CPPHC framework[12] and provided in **Table 3**. Instead of graded recommendations, the approach for providing practical guidance for experiential education is based on different practice/rotation settings, progressing from patient-centered ("micro" level) to population-based ("macro" level). Practice/rotation settings detailed include ambulatory care, community pharmacy, hospital or health-system practice and population-focused and public policy agencies.

Service learning is one example of how public health can be incorporated into the experiential education curriculum. The National Service Learning Clearinghouse describes service learning as "*a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities.*"[25] Examples of service learning projects may include but are not limited to: educating the community regarding safe medication use and disposal (subdomain 3.2), conducting chronic disease screening and education (subdomains 2.1 2.3, 2.4,3.3), patient counseling (subdomain 3.6), working in an interprofessional team to address social and healthcare needs, particularly in underserved areas (subdomains 2.1, 3.3, 3.5). These activities can be incorporated across the curriculum. A recent survey of 34 C/SOPs regarding service learning indicated that 85% reported a service learning component in their program, within IPPEs (82%), elective didactic courses (24%), core didactic courses (20%), APPEs (10%) and other areas such as extracurricular activities, orientation week and/or service progression requirements (8%).[26]

Conway *et al*. described the development and implementation of IPPE and APPE rotations within campus-based clinics at the University of Oklahoma College of Pharmacy.[27] After completing the rotation, there was an increase in student pharmacists' knowledge and self-rating of perceptions and attitudes towards administering immunizations.[27] Kearney additionally discussed the use of service-learning course for first year student pharmacists at the MCPHS University School of Pharmacy-Worcester/Manchester, which improved outcomes in areas such as professional communication and cultural competence.[28] Furthermore, Duquesne University employs an IPPE experience entitled *Health Promotion/Disease Prevention & Management Service Learning*, completed during the third professional year. This experience introduces student pharmacists to population-based pharmacy care through a wide variety of community-engaged activities, including (1) participation in the Spirit of Health Van, a mobile unit providing health screenings and immunizations to the community, (2) outreach with Katy's

Kids in preschool and elementary schools to educate about medication safety, and (3) work with middle and high schools to provide education on the neuroscience between prescription and illicit drug abuse.

APPE rotations within local health departments, Federally Qualified Health Centers (FQHC) and free clinics are also becoming more common amongst C/SOPs.[29] In 2008, Patterson described the development and implementation of an APPE rotation at the Kansas City Free Health Clinic.[30] The rotation reinforced concepts of cultural competence, health disparities, health literacy as well as providing direct patient care within several disease prevention and chronic disease management clinics.[30] Activities included public health and disease related topic discussion (subdomain 2.1), creating health literacy materials (subdomain 3.3), a community outreach project (subdomain 2.4) and providing pharmaceutical care (subdomains 2.1, 2.3, 3.5, 3.6).[30] APPE rotations have also been developed by many federal public health agencies. The Food and Drug Administration (FDA) has an established FDA Pharmacy Student Experiential Program which ranges from 4 to 6 weeks. Rotations are offered in several of the FDA Offices or Division, such as Office of Regulatory Policy, Office of Minority Health, Division of Drug Information, etc.[31] Similarly, the CDC and the Indian Health Service (IHS) also offer APPE opportunities for student pharmacists.[32-33] These types of rotations offer unique opportunities for student pharmacists to see firsthand the role of public health pharmacists within these different agencies. These rotations may also help student pharmacists reinforce important public health concepts such as epidemiology and informatics (subdomain 2.4), health policy and program development and evaluation (subdomain 3.3), global health (subdomain 4.1), and public health advocacy and leadership (subdomains 3.6, 4.2). Not only do these types of public health agencies offer APPE rotations, they also may offer paid or unpaid summer internships during the earlier part of a student pharmacist's education.

Lastly, global/international (G/I) pharmacy practice experiences also are an opportunity for student pharmacists to strengthen competence in CAPE 2013 outcomes. These G/I experiences frequently involve significant public health content, such as health education in group settings, community-based outreaches, and even surveys. G/I experiences can strengthen health promotion skill (subdomain 2.3), cultural competence (subdomain 3.5), and communication skill (subdomain 3.6). These rotations are frequently completed as interprofessional experiences with medical, dental, nursing and other health professions (subdomain 3.3). The many new experiences one is exposed to during a G/I encounter also force the student to reflect on their own experiences, beliefs and values in a way that can help in their career planning (subdomain 4.1). A wider discussion of G/I pharmacy education has been reported by the AACP Global Pharmacy Education SIG in an independent CAPE paper.[34]

F. Interprofessional educational experiences

Interprofessional collaboration and education (IPE) (subdomain 3.4) is becoming more prominent within the pharmacy curricula. IPE can be accomplished both from a didactic and experiential standpoint, but it also is highly dependent on the resources, class sizes and access to other healthcare professional schools. Developing IPE experiences with objectives that can be mapped back to each of the participating health disciplines program or course-specific goals can be challenging. Developing IPE experiences with a public health focus may be a way to overcome some of these challenges and allow for a meaningful and enriching experience, which benefits not only the students but also the community.

At the Medical University of South Carolina (MUSC) College of Pharmacy, an interprofessional service-learning project to establish a health promotion program (subdomains 2.3, 2.4) was implemented along with seven other healthcare disciplines which included: physician assistant, medicine, pharmacy, dietetic internship, physical therapy, master in health administration, nursing and biomedical science. The results indicated that the students gained a better appreciation of working with other healthcare professional students and a better understanding of the role of other healthcare professions within an interprofessional team.[35] Furthermore, at the Virginia Commonwealth University (VCU) School of Pharmacy along with the medical and nursing school, an interprofessional team of students provided health screenings and education to the Hispanic community (subdomains 2.3, 2.4, 3.5, 3.6).[36] Students working in these teams reported having a greater understanding of healthcare access and barriers, community needs, and social determinants of health.

G. Co-curricular experiences

Student organizations provide opportunities for optional experiential content related to public health. Organizations such as the American Pharmacists Association Academy of Student Pharmacists (APhA-ASP) offers student pharmacists a variety of opportunities to take part in different public health initiatives in patient care and community service such as Generation Rx, Operation Diabetes, Operation Heart and Operation Immunization.[37] In addition, APhA has been the leading pharmacy organization to advocate for pharmacists providing immunization services as a means of increasing access to immunization services for the general population. With the expanding role of immunizing pharmacists, many C/SOPs have integrated the APhA *Pharmacy-Based Immunization Delivery Certificate* program[38] as part of their didactic or experiential curriculum. This allows student pharmacists to become more knowledgeable about vaccines and serve as advocates, and in some states even administer vaccines under the supervision of an immunizing pharmacist.

The importance of research and providing student pharmacists with research opportunities also needs to be emphasized, especially with the increase in graduating pharmacists seeking postgraduate training. Although not all C/SOPs require student pharmacists to complete a research project as a graduation requirement, many may choose to seek out these additional opportunities. A public health-related research project, either required or elective, could also be integrated.

Domestic and international opportunities also are valuable co-curricular experiences that may help to emphasize important public health concepts. These types of opportunities may be available through the C/SOP, university or outside organizations. The experiences and activities can vary from providing care as an interprofessional team, addressing barriers to care, educating the public, etc. Some C/SOPs have been able to develop and integrate these types of international or domestic experiences as part of a didactic course or APPE rotation.[39-40]

III. Assessment

A. Introduction

The current ACPE Standards 2016 challenge all C/SOPs to "*develop, resource, and implement a plan to assess attainment of educational outcomes.*"[11] Many C/SOPs are likely engaging in assessment activities that can be used or modified to measure student pharmacists' achievement of public health knowledge, ability, and/or skills. Curricular maps can be used to link the CAPE 2013 outcomes to the content in relevant public health courses within the curriculum as part of an overall assessment plan. C/SOPs should be sure to map course level outcomes (learning objectives) to program level outcomes (CAPE 2013 outcomes). The curricular mapping should be purposeful to include early exposure and planned redundancies related to public health education in both the experiential and didactic curriculum. Student pharmacist evaluations of courses, both didactic and experiential, that are partly or entirely dedicated to public health topics can provide key assessment data. Course directors and faculty participating in these courses also should conduct evaluations to ensure measurement of relevant learning objectives.

As discussed previously, a major driver of the curriculum within the public health profession itself is the MPH Core Competency Model.[15] While it is recognized that most student pharmacists will not pursue MPH training, there are noteworthy similarities between the MPH Core Competency Model and the CAPE 2013 outcomes that should impact assessment activities:

- Both are intended to assess the baseline knowledge of student pharmacists upon graduation.
- Both are intended to encompass knowledge, skills, and attitudes/affective domain.
- Both explicitly recognize the importance of an interprofessional healthcare team.
- All competency statements are intentionally general, to be applied regardless of area of specialization or intended career trajectory upon graduation.

The most relevant curricular tool that may be used is the CPPHC framework. The task force that designed the framework recommends that all health professions education programs, including pharmacy, "*systematically determine whether appropriate domains and topic areas in the Curriculum Framework are part of its standardized examinations for licensure and certification as well as program accreditation.*"[12] The North American Pharmacist Licensure Examination (NAPLEX) competency statements were recently revised in July 2014 and went into effect on November 1, 2015. Several of the competency statements are directly related to public health (**Box 3**).[41] However, using the NAPLEX as a tool for assessment of public health outcomes is difficult because the questions are not developed by individual C/SOPs, and individualized content area scoring is not available for C/SOPs to use as feedback to their curricula.

Box 3: NAPLEX revised competency statements relevant to public health assessment[41]

1.1.0: Obtain, interpret, assess, and/or evaluate:
- 1.1.3: Results from instruments and screening strategies used to assess patients
- 1.1.7: Risk factors relevant to the prevention of a disease or medical condition and the maintenance of wellness
- 1.1.8: Information from interdisciplinary health care providers

1.4.0: Techniques for effective communication/documentation of the development, implementation, and assessment of individualized treatment plans to:
- 1.4.1: Patients and/or patients' agents
- 1.4.2: Interdisciplinary health care providers

1.5.0: Advocate individual and population-based health and safety, considering:
- 1.5.1: Best practices, scientific literature evaluation, and health-related resources
- 1.5.2: Quality improvement strategies in medication-use systems
- 1.5.3: Processes, evaluation of, and responses regarding medication errors
- 1.5.4: Role of automated systems and technology in medication distribution processes
- 1.5.5: Emergency preparedness protocols

With the implementation of ACPE Standards 2016, the Pharmacy Curriculum Outcomes Assessment (PCOA) will be required as a standardized and comparable assessment within pharmacy curricula.[11] The PCOA, developed

and administered by the National Association of Boards of Pharmacy (NABP) like the NAPLEX, can serve as an assessment tool in the realm of public health as it contains several relevant content and subtopic areas (**Box 4**).[42] C/SOPs receive feedback on content area performance as well as global performance on the assessment for student pharmacists. The primary use of the PCOA is as a tool for C/SOP curricular revision and guidance, but also may have utility for individual student assessment of learning, such as within the topic of public health.

Box 4: PCOA content areas relevant to public health assessment[42]

3A: Healthcare and public health delivery systems
- 3A02: Social, political, and economic factors influencing the delivery of healthcare (including financing and reimbursement mechanisms, health disparities, reform, etc.)
- 3A04: Health policy development and evaluation
- 3A06: Conflict between medical care and public health
- 3A07: Contributions of public health efforts to health status improvements (infectious disease control, chronic disease preventions, demographics, and social and physical environmental factors, etc.)

3B: Economics/pharmacoeconomics
- 3B01: Use of pharmacoeconomic analyses (i.e., cost-benefit analysis, cost-effectiveness analysis, cost-minimization analysis, cost-utility analysis)
- 3B02: Applications of economic, clinical, and humanistic outcomes to improve allocation of limited healthcare resources
- 3B03: General macro and micro economic principles

3D: Pharmacoepidemiology
- 3D01: Application of epidemiological study designs to study drug use and outcomes in large populations
- 3D02: Data sources and analytic tools that provide an estimate of the probability of beneficial or adverse effects of medication use in large populations
- 3D03: Methods for continually monitoring unwanted effects and other safety-related aspects of medication use in large populations

3F: Biostatistics and research design
- 3F01: Commonly used experimental and observational study designs
- 3F02: Commonly used statistical tests and their appropriate application
- 3F03: Evaluation of statistical results including an understanding of statistical versus clinical significance

3H: Core communication concepts and skills
- 3H04: Health literacy
- 3H05: Cultural competency

3I: Social and behavioral aspects encountered in practice
- 3I01: Health, illness, and sick role behaviors
- 3I02: Principles of behavior modification
- 3I03: Patient adherence

4A Literature evaluation – practice guidelines and clinical trials
- 4A02: Integration of core scientific and systems-based knowledge in patient care decisions
- 4A04: Evaluation of clinical trials that validate treatment usefulness

4E Clinical prevention and population health
- 4E01: Promotion of wellness and non-pharmacologic therapies
- 4E02: Disease prevention and monitoring

B. CAPE 2013 outcomes

Beyond the opportunities for programmatic assessment of public health, faculty may also desire to assess specific public health abilities related to the CAPE 2013 outcomes. For those situations, a sampling of available tools and opportunities is described in the following sections. Woven throughout these sections are specific examples (**Boxes 5-9**) of how public health-oriented activities can be delivered and assessed within pharmacy curricula, with reference to relevant CAPE outcomes.

1. Learner (1.1)

Public health needs to be built on foundational sciences and through the application of evidence-based methods. In order to apply evidence generated from within public health, pharmacists need to be able to critically analyze that field of literature as it relates to pharmacy-specific public health issues. Public health also is a social science, so that foundational knowledge in disciplines such as history, health policy, human behavior, politics, anthropology, and psychology are also utilized in the process of selecting interventions or methodologies that may impact patient-centered and population-based care. Assessing competency as a learner in these broad public health categories is more difficult, but examples are available. The North Dakota State University School of Pharmacy offers a *Public Health for Pharmacists* certificate that both educates and assesses the learner in several core public health topics.[43] Continuing education for pharmacists that cover specific public health topics also provide opportunities for self-assessment or external assessment in one's competency as a learner.

Box 5: Designing pharmacist-run public health interventions

Student pharmacists design a public health intervention that could be delivered within a community pharmacy setting, culminating knowledge at the end of a required semester-long didactic course in public health. The activity is completed as a written assignment and assessed through both student peer review, as well as by the course instructor.

Components of the rubric include: (1) population health impact, (2) evidence-based use of behavioral science, (3) ability to design the intervention so that health outcomes assessment can be done, (4) focus in high-priority chronic diseases, (5) appropriate utilization of pharmacy practice skills and the pharmacy work environment.

Outcomes of the activity include a summative assessment of core aspects of the public health curriculum (1.1), as well as enhancement of communication (3.6), opportunity for student pharmacists to apply evaluative skills (4.1), and to exercise and develop innovation in their practice (4.3).

2. Patient-centered care (2.1)

By taking direct responsibilities for individual patient's drug therapy, student pharmacists can make a unique contribution to the outcome of pharmacotherapy and patient's quality of life. Student pharmacists must acquire new knowledge and skills to effectively contribute to the outcome of medication therapy in a patient-care model.[44] Therefore, an important outcome for pharmacy education is to cultivate graduates capable of providing such

pharmacy care services. The outcome must be measured through didactic learning courses, gathering related objective and subjective information directly from patient and prepare a therapeutic plan based on current evidences (CPPHC component/domain 1.3), and a thorough literature evaluation and interpretation. Student pharmacists must then apply knowledge of public health, including screening (CPPHC component/domain 2.1), health behavioral science (CPPHC component/domain 2.2), and population health management (CPPHC component/domain 3.1) to their final clinical decisions.[12] The outcome of patient-centered care in pharmacy education can be measured step by step as it relates to the following objectives, as utilized by the University of Arkansas:[45]

- Advance patient specific rational pharmacotherapy based on best and current evidence and literature.
- Establish effective communications with patient and health care team utilizing documentation exercises.
- Demonstrate professional/ethical behavior in a patient centered care setting with interdisciplinary respect.
- Demonstrate the ability of evaluation, interpretation and application of professional literature in a patient-centered care setting.

In order to restructure a required communication course and improve an efficient communication skills, Horton *et al*. proposed a standardized counseling rubric for student pharmacists.[46] The revised course improved student pharmacists' abilities of counseling. There were several factors considered in relate to student counseling evaluation. These factors evaluate different aspects of attending behaviors (e.g., eye contact, body language, vocal qualities, verbal tracking, and distant from patient), verbal skills (e.g., appropriate language, use of questions, and facilitated the conversation), and counseling structure (e.g., introduction, determine patient knowledge, medication regimen, MED benefit/ADR, patient-specific medication issues, verifying patient knowledge and closing).[46]

3. Health and wellness (2.3)

To promote health and wellness, student pharmacists must learn how to incorporate public health methods in implementing preventive strategies to manage chronic disease in individuals and communities. A total of five sub-domains of CAPE 2013 could be utilized to promote excellence pharmacy practice and education in combination with public health policies. To approach this plan the following CPPHC component/domains should be considered when assessing the outcomes, including implementation of health promotion/disease prevention interventions (1.4), determinants of health (1.5), screening (2.1), immunization (2.3) and preventive medication (2.4).

The use of the Assessment, Development, Assurance Pharmacist's Tool (ADAPT) by pharmacists and student pharmacists can facilitate planning, establishment, implementation, and interpretation of pharmacist-directed

health promotion programs (**Appendix 2**).[47] The instrument consists of 36 items of developed using a public health framework and the ten essential services identified by CDC to ensure high-quality health promotion programs and interventions are provided by pharmacist.[47] This tool can be applied to a variety of settings, including IPPEs, APPEs, service learning, or community outreach activities.[47]

Box 6: Skills to facilitate and enhance patient wellness

Student pharmacists complete smoking cessation training within a patient care skills laboratory sequence. The activity is aligned with a therapeutics sequence in respiratory disease and builds upon previous coursework on motivational interviewing in pharmacy practice coursework. Student pharmacists work through comprehensive patient cases and undergo a simulated patient encounter employing the use of the 5 As and counseling for smoking cessation agents.

Student pharmacists are assessed by the simulated patient for counseling technique, as well as by the instructor for recommendations and use of motivational interviewing techniques.

Outcomes of the activity include provision of patient-centered care (2.2) through a health and wellness lens (2.3), including the demonstration of education (3.2) and communication skills (3.6).

4. Population-based care (2.4)

Developed by CDC's Division of Community Health, the online resource center to plan, launch, develop and evaluate community health programs includes links to hundreds of useful tools.[48] These tools include planning guides, evaluation frameworks, communication materials, health risk factors data and statistics, fact sheets, scientific articles, key reports and state and local program contacts. To compare health status across a population, a set of metrics is necessary for improvement of community health and to facilitate collaboration between health organizations. The CDC provides information to prepare this set of metrics to facilitate efforts involving assessing population health; they identified 42 metrics, broadly characterized into health outcomes and health determinants. To organize these metrics, CDC used a population health framework. Outcomes were categorized either as mortality or morbidity, and health determinants were categorized to health care, personal behaviors, demographics and the social environment, and the physical environment. This model is beneficial when assessing CAPE 2013 outcomes in combination of public health competencies.

A structured and comprehensive curriculum using population healthcare metrics for integrating clinical prevention and population health is important in pharmacy education. Prevention education is important to improve population health and reduce costs. Advancing interprofessional learning with some educational projects can benefit student pharmacists to participate in clinical prevention and drug monitoring projects. It also will enhance skills in communication within and between disciplines. Assessment of these health improvement projects at community level is available through set of various study designs, such as epidemiology and pharmacoepidemiology studies.

Box 7: Connecting the curricular and co-curricular activities

Didactic coursework on immunization is delivered in both a stand-alone public health course as well as within the infectious disease pharmacotherapy course sequence. At the completion of the third professional year, student pharmacists complete the APhA *Pharmacy-Based Immunization Delivery Certificate* program in preparation for APPE rotations. In the fall semester, student pharmacists are given the opportunity to administer flu vaccinations for an event on campus hosted by the APhA-ASP chapter. Student pharmacists earlier in the curriculum are able to assist in organization and administration of the event, and are matched up with student pharmacists administering vaccines for observational experience in preparation for their own future training. Clinical faculty provide preceptor oversight of the event.

Outcomes for the activity include provision of population-based care (2.4) and application of didactic and experiential training (1.1) within a service-learning environment (4.2 and 4.4).

5. Educator (3.2)

Studies have shown that between 40 to 80% of the medical information patients receive from healthcare providers is forgotten immediately and nearly half of the information retained is incorrect.[49] The teach-back method is one of the easiest and most widely adopted ways to help healthcare providers close the gap of communication. Teach-back is a way to ensure that practitioners have explained to the patient what they need to know in a manner that the patient understands. If a patient understands, they are able to "teach back" the information accurately. The method can be assessed using a self-evaluation and tracking log. This assessment tool can be helpful for those new to the method to document their experiences, and can also identify best practices for the teach-back method that can be shared among practitioners.[50] In one study, student use of the teach-back method among independent-living senior residents improved satisfaction, understanding of health information, more confidence and greater commitment to medication adherence.[51]

6. Patient advocacy (3.3)

Pharmacists are often in a position to help patients improve and or maintain personal health goals related to diet, nutrition, substance abuse, stress management, sleep habits, exercise, etc. In order to achieve these goals, patients may need to explore health beliefs and implement behavior change. Before being skilled at applying Health Belief Models to patients, student pharmacists may benefit from personal experience with these principles. The *My First Patient* program provides exposure to a series of health screenings for first-year student pharmacists.[52] The student pharmacists also are asked to develop his or her own personal health portfolio and action plan. The action plan was intended to identify strategies targeted to improve and/or maintain each student's personal health goals.

The assessment plan for the course included written assignments, student pharmacist reflections, and follow-up surveys.[52] A group discussion was conducted four weeks after action plans were implemented for follow-up, and a written survey was delivered as follow-up at 6 months.[51] Review of the action plan assignment by course faculty

demonstrated that student pharmacists had indeed proceeded through behavior change.[52] The action plans within the *My First Patient* program provides the foundation for student pharmacists to take responsibility for their own health, which strongly suggests they have the capacity to advocate for their future patients' health.[52]

Motivational interviewing is one important example of a technique frequently used in pharmacy practice. It is a directive, patient-centered counseling style that attempts to elicit behavior change by helping patients explore and resolve ambivalence and resistance to change.[53] By employing the principles of motivational interviewing, student pharmacists can empower patients to address a variety of health issues that are often discussed during patient consultations including medication adherence, health screenings, substance use, smoking cessation, nutrition, and exercise. An elective course designed to prepare student pharmacists in motivational interviewing techniques was designed and implemented at the UMKC School of Pharmacy.[54] Student pharmacists were assisted in developing their skills through required readings, interactive lectures, in-class demonstrations and practice sessions, out of class skills practice, one-on-one supervision provided by doctoral level clinical health psychology students, and written reflections on each class session.[54] Student pharmacists' motivational interviewing skills were assessed through out-of-class practice sessions, and practice interviews were graded by clinical psychology doctoral students on a 7-point Likert scale (1=poor/never to 7=excellent/always) on their use of motivational interviewing skills.[54] The interviews were rated on skills such as expressing empathy, using reflective listening, and eliciting change talk. [54]

7. Cultural sensitivity (3.5)

A patient's culture undoubtedly influences his or her attitudes and behaviors toward health and disease. The US population continues to grow increasingly diverse, which only highlights the significant health disparities which exist between various populations. Cultural sensitivity is an essential characteristic for health care providers because of its impact on improving health outcomes and decreasing health disparities. There are a limited number of cultural sensitivity/competency assessment tools that are designed for use with students and have also been validated in student pharmacists.[55-56] Poirier *et al*. discusses a course on health promotion and literacy at the Southern Illinois University Edwardsville (SIUE) School of Pharmacy that utilized the Inventory for Assessing the Process of Cultural Competence among Healthcare Professionals (IAPCC-R), a 25-item instrument that measures constructs of cultural awareness, cultural knowledge, cultural skill, cultural encounter, and cultural desire.[57] There is great opportunity for integration of this tool into pharmacy curricula to measure learning of cultural sensitivity from several perspectives.

On the programmatic level, the American Association of Medical Colleges has developed and revised the Tool for Assessing Cultural Competence Training (TACCT), a self-administered assessment tool designed to increase the

cultural competence of health professions students.[58] It includes a comprehensive survey which allows C/SOPs to identify key curricular areas for teaching and learning in cultural competence training and assess student knowledge, skills, and attitudes in cultural competence.[58]

Box 8: Addressing the needs of individual patients within a collaborative framework

Student pharmacists complete a didactic module focusing on health disparities, cultural competency, and health literacy within a public health and epidemiology course. An interprofessional seminar is scheduled which brings together students across health disciplines to work through case studies. Student pharmacists are put into interdisciplinary groups to work through cases, and faculty members lead discuss and debriefing from the activity.

Student pharmacists provide peer evaluations for members of their group, and turn in individual reflection papers for the activity and its effect on their understanding of clinical care.

Student pharmacists work to deliver effective patient care (2.1) by determining the needs of patients within their case studies (3.1). A cultural focus is incorporated into the clinical cases (3.5) to be addressed by the healthcare professions students (3.4).

8. Communication (3.6)

Health care practitioners can be successful through effective communication and improved listening skills. Pharmacists as one of the most accessible health care members have an important role in active communication with patients, other team members, and the public.[59-60] A course on communication for student pharmacists was assessed via Adrian, *et al*.[59] Student pharmacists' oral and written communication skills were measured through a role playing model in an active learning setting.[59] The measurements created tools to assess their abilities of creating effective verbal and written communications.[59] The highlights of this evaluation rubric includes professionalism and empathy, content, and delivery. To achieve the best score, student pharmacists must show professionalism toward their patients, be caring and compassionate, and they must be able to deliver and explain the information to patients accurately and coherently.[59] Student pharmacists must be relaxed and confident when delivering the information, and be able to interact with patient effectively.[59] The outcome of this study examined student pharmacists' baseline assessment of themselves and compared it to the coordinator's assessment and found demonstration of improvement in both oral and written skills after completion of activities.[59]

9. Self-awareness (4.1)

As healthcare professionals, pharmacists are expected to remain competent and be life-long learners. Self-awareness enables pharmacists to identify strengths and areas for improvement in order to have the most current knowledge for the delivery of patient-centered care and population-based intervention to ensure optimal health outcomes. To achieve such goals, pharmacists have to know learning styles to pursue lifelong learning. One assessment tool available is the Pharmacist's Inventory of Learning Styles (PILS), which was developed and

validated as a learning styles instrument for pharmacy practice and education.[61] The PILS provides distinctive pharmacist-specific model for defining, describing, and measuring learning styles.[61]

In terms of global health, specifically medical missions, one tool that can be helpful is the Wesleyan Intercultural Competence Scale (WICS), which includes 16 different situations that students or pharmacists are most likely to encounter when they travel abroad and identify self-awareness.[62] This instrument was rated for its validity and reliability as well as its ability to detect changes in intercultural awareness and competency skills over time. There are six stages to this scale.[62] The first three stages are related to ethnocentrism, the belief of self-superiority dictated by the denial, defense, and minimization phases.[62] The next three stages related to ethno-relativism in which the belief of equality of all groups that are shown in the acceptance, adaptation, and integration phases.[62]

10. Leadership (4.2)

The pharmacist has the opportunity to demonstrate leadership in the public health arena. The pharmacist's location within the community, as well as the large traffic of many and diverse community members who frequent the pharmacy, allows them to understand community needs in a unique way. Triennial Community Health Needs Assessments are mandated of all hospitals by the Affordable Care Act, and community pharmacists could make irreplaceable contributions to these committees through their participation and leadership. The Association for Community Health Improvement has a Community Health Assessment Toolkit which can be used to guide these assessments.[63] Pharmacists also hold shared responsibility for decision-making within an interprofessional healthcare team; participation in interprofessional courses while in pharmacy school provides another opportunity to assess one's leadership ability, particularly with regard to working in interprofessional teams. The Myers-Briggs Type Indicator has been used effectively to assess personality type, and predilection for certain roles, for many decades.[64] More recently, the Clifton StrengthsFinders™ has been used to help students assess their leadership skills and other unique strengths.[65] A study of five C/SOPs and 1244 students completing the assessment found the top five themes among pharmacy students were *Achiever*, *Harmony*, *Learner*, *Responsibility*, and *Empathy*.[66]

Box 9: Using experiential service to apply classroom concepts

After completion of the first professional year, student pharmacists complete a longitudinal IPPE experience focused on the provision of the public health activities, introduced in the didactic curriculum within the previous academic year. IPPE requirements are met through the provision of 80 hours of disease screenings and/or medication/disease education within the community. Student pharmacists develop educational materials for the sessions, which are conducted at local schools, senior centers and other public spaces.

Faculty provide formative evaluation on the content of educational materials, and after revision, clinical faculty supervise student activities during the events. After the experiential component is completed, student pharmacists participate in a discussion regarding how they might continue to execute similar activities within various pharmacy career settings in the future.

Students promote health and wellness topics (2.3) through education (3.2) and communication (3.6), while simultaneously promoting the valuable role of the pharmacist within the community (4.2, 4.4).

IV. Conclusion

Public health is a unique area of study and practice focused on improving and sustaining the health of communities. Public health is most effective within a multidisciplinary effort to execute public health services, and an emphasis in curricula across all other health professions. In the field of pharmacy, various aspects of public health are reflected within the CAPE 2013 outcomes, and accreditation standards and curricular frameworks between the two professions have created areas of significant overlap. This paper has discussed how public health can be incorporated into a pharmacy curriculum, with consideration to both pedagogy and assessment, and how this aligns to the CAPE 2013 outcomes. A continuing focus on public health areas within the field of pharmacy will be necessary for the profession to meet expectations for contributions to community health in the future.

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VI. Tables

Table 1: Mapping of CAPE 2013 outcomes to other public health-related frameworks

Relevant CAPE 2013 outcomes[10]	**Relevant required element(s) of the Pharm.D. curriculum from ACPE Standards 2016[11]**	**Relevant core area(s) from the MPH Core Competency Model[15]**	**Relevant component/domain(s) from the CPPHC framework[12]**
1.1: Learner	All areas	All areas	All areas
2.1: Patient-centered care	▪ Medication dispensing, distribution and administration ▪ Immunology ▪ Medical microbiology ▪ Clinical chemistry ▪ Pathology/pathophysiology ▪ Patient assessment ▪ Pharmacotherapy ▪ Self-care pharmacotherapy ▪ Natural products and alternative and complementary therapies ▪ Cultural awareness ▪ Practice management ▪ Health informatics	(4): Health policy and management (5): Social/behavioral sciences (6): Communication and informatics (7): Diversity and culture (9): Public health biology	(1.3): Evidence-based practice (1.5): Determinants of health (1.6): Population health informatics (2.1): Screening (2.2): Counseling for behavioral change (2.3): Immunization (2.4): Preventive medication (2.5): Other preventive interventions (3.1): Incorporating population health into clinical care (3.6): Cultural dimensions of practice
2.3: Health and wellness	▪ Pharmacotherapy ▪ Public health ▪ Self-care pharmacotherapy ▪ Natural products and alternative and complementary therapies ▪ Cultural awareness ▪ Professional communication ▪ Research design ▪ Biostatistics ▪ Health information retrieval and evaluation	(1): Biostatistics (2): Epidemiology (3): Environmental health sciences (5): Social/behavioral sciences (9): Public health biology	(1.2): Etiology, benefits and harms-health research evaluation (1.4): Implementation of health promotion/disease prevention interventions (1.5): Determinants of health (2.1): Screening (2.2): Counseling for behavioral change (2.3): Immunization (2.4): Preventive medication (2.5): Other preventive interventions (3.2): Partnering with the public to improve health
2.4: Population-based care	▪ Biostatistics ▪ Pharmacoeconomics ▪ Pharmacoepidemiology ▪ Practice management ▪ Healthcare systems ▪ Health informatics ▪ Research design ▪ Public health ▪ Medication dispensing, distribution, administration and systems management	(1): Biostatistics (2): Epidemiology (4): Health policy and management (5): Social/behavioral sciences (6): Communication and informatics (12): Systems thinking	(1.1): Descriptive epidemiology (1.2): Etiology, benefits and harms-health research evaluation (1.4): Implementation of health promotion/disease prevention interventions (1.5): Determinants of health (1.6): Population health informatics (1.7): Evaluation (3.3): Environmental health (3.4): Occupational health (3.7): Emergency preparedness and response systems

Table 1 (cont): Mapping of CAPE 2013 outcomes to other public health frameworks

Relevant CAPE 2013 outcomes[10]	**Relevant required element(s) of the Pharm.D. curriculum from ACPE Standards 2016[11]**	**Relevant core area(s) from the MPH Core Competency Model[15]**	**Relevant component/domain(s) from the CPPHC framework[12]**
3.2: Educator	▪ Research design ▪ Health information retrieval and evaluation ▪ Biostatistics ▪ Professional communication ▪ Public health	(1): Biostatistics (4): Health policy and management (5): Social/behavioral sciences (6): Communication and informatics	(1.2): Health research evaluation (1.3): Evidence-based practice (4.2): Health services financing
3.3: Patient advocacy	▪ Healthcare systems ▪ Pharmacy law and regulatory affairs ▪ Patient safety ▪ Ethics	(4): Health policy and management (6): Communication and informatics (11): Program planning	(1.7): Evaluation (4.2): Health policy process
3.5: Cultural sensitivity	▪ Cultural awareness ▪ Ethics ▪ Natural products and alternative and complementary therapies ▪ Public health	(7): Diversity and culture	(1.5): Determinants of health (3.6): Cultural dimensions of practice
3.6: Communication	▪ Professional communication	(6): Communication and informatics	(3.2): Partnering with the public to improve health (2.2): Counseling for behavioral change
4.1: Self-awareness	▪ Professional development/social and behavioral aspects of pharmacy ▪ Ethics	(8): Leadership (10): Professionalism	(3.5): Global health issues (4.3): Clinical and public health workforce
4.2: Leadership	▪ Pharmacy law and regulatory affairs ▪ Patient safety ▪ Professional development/social and behavioral aspects of pharmacy ▪ Ethics ▪ Healthcare systems	(4): Health policy and management (8): Leadership (10): Professionalism	(4.1): Organization of clinical and public health systems (4.3): Clinical and public health workforce

Table 2: Competency areas for integration of public health into didactic pharmacy curricula

Note: content derived and organized from CAPE 2013,[10] ACPE Standards 2016,[11] JCPP Vision of Pharmacy Practice,[17] CPPHC framework,[12] and MPH Core Competency Model[15]

CPPHC framework[12]	**Content Grade I** **(i.e. strongly recommended to be included in the required Pharm.D. curriculum)**	**Content Grade II** **(i.e. suggested for students pursuing advanced training such as MPH or minor in public health)**
Component 1: Foundations of population health		
(1.1): Descriptive epidemiology: the health of populations	▪ Burden of disease and injury (e.g., morbidity and mortality) ▪ Determinants of health, disease and injury (e.g., genetic, behavioral, socioeconomic, environmental, access and quality of healthcare) ▪ Distribution of disease and injury (e.g., person, place and time) ▪ Public/population health principles ▪ Course of disease and injury (e.g., incidence, prevalence, case-fatality) ▪ Data sources (e.g., vital statistics, active and passive public health surveillance)	▪ Basic ethical and legal principles pertaining to the collection, maintenance, use and dissemination of epidemiologic data
(1.2) Etiology, benefits and harms: health research evaluation	▪ Study designs (e.g., surveys, observational studies, randomized clinical trials) ▪ Pharmacoepidemiology ▪ Inference (e.g., statistical significance tests and confidence intervals) ▪ Quality/presentation of data (e.g., accuracy, precision/use of graphics) ▪ Principles of epidemiology ▪ Basic terminology and definitions of epidemiology ▪ Estimation and magnitude of the association (e.g., relative risk/odds ratio, attributable risk, percentage, number needed to treat, and population impact measures) ▪ Confounding and interaction concepts and basic methods for addressing	▪ Basic theories, concepts and models from a range of social and behavioral disciplines that are used in public health research and practice ▪ Steps and procedures for the planning, implementation and evaluation of public health programs, policies and interventions ▪ Critical stakeholders for the planning, implementation and evaluation of public health programs, policies and interventions ▪ Differences between qualitative and quantitative evaluation methods in relation to their strengths, limitations, and appropriate uses, and emphasis on reliability and validity

Table 2 (cont.): Competency areas for integration of public health into didactic pharmacy curricula

CPPHC framework[12]	**Content Grade I** **(i.e. strongly recommended to be included in the required Pharm.D. curriculum)**	**Content Grade II** **(i.e. suggested for students pursuing advanced training such as MPH or minor in public health)**
Component 1: Foundations of population health, cont.		
(1.3): Evidence-based practice	▪ Evidence quality assessment (types of studies and the relevance to the target population) ▪ Effect magnitude assessment (incorporating benefits, harms, values) ▪ Process of 'grading' recommendations based on the clinical evidence and magnitude of effect ▪ Principles of evidence-based medicine ▪ Interpretation of results of statistical analyses found in public health studies	▪ Communication of epidemiologic information to lay and professional audiences
(1.4): Implementation of health promotion and disease prevention interventions	▪ Design of prevention, intervention, and educational strategies for individuals and communities to manage chronic disease and improve health and wellness ▪ Evaluation (e.g., quality improvement and patient safety, outcome assessment, reassessment of remaining problems) ▪ Quality assurance strategies ▪ Types of prevention (e.g., primary, secondary, tertiary) ▪ Target of intervention (e.g., individuals, high risk groups, populations) ▪ How to intervene (e.g., education, incentives for behavior change, laws and policies, engineering solutions) ▪ Pharmacovigilance/risk management ▪ Effect of social determinants of health (e.g., income, education, access to transportation, cultures) on the receipt of preventive services ▪ Practice-based systems to aid with the provision of preventive services ▪ Impact of a population health focus on the health of individuals and communities	▪ Descriptive and inferential methodologies according to the type of study design for answering a particular research question ▪ Targets and levels of intervention for social and behavioral science programs and/or policies ▪ Effective incentives, policy changes, and/or interventions for effective implementation ▪ Evidence-based approaches in the development and evaluation of social and behavioral science interventions ▪ Ethical principles to public health program planning, implementation and evaluation ▪ Differences in among goals, measurable objectives, related activities, and expected outcomes for a public health program

Table 2 (cont.): Competency areas for integration of public health into didactic Pharm.D. curricula

CPPHC framework[12]	**Content Grade I** **(i.e. strongly recommended to be included in the required Pharm.D. curriculum)**	**Content Grade II** **(i.e. suggested for students pursuing advanced training such as MPH or minor in public health)**
Component 1: Foundations of population health, cont.		
(1.5): Determinants of health	▪ Impact of social factors on individual behaviors (e.g., education/employment opportunities, norms and attitudes, incomes) ▪ Importance of healthcare as a determinant of health ▪ Relationship between human health, animal health and ecosystem health and implications for emerging infectious disease and geographic spread of disease ▪ Impact on health of the unaltered environment, altered environment and built environment ▪ Impact of policy and law as determinants of health and disease	
(1.6): Population health informatics	▪ Collection and utilization of population health data to assess population health, guide the provision of health care services and analyze health outcomes ▪ Timely and accurate documentation and delivery of information about preventive services and reportable diseases to public health agencies ▪ Basic informatics techniques with vital statistics and public health records in the description of public health characteristics and in public health research and evaluation ▪ Use information technology to access, evaluate, and interpret public health data	▪ Collaboration with communication and informatics specialists in the process of design, implementation, and evaluation of public health programs ▪ Informatics methods and resources as strategic tools to promote public health ▪ Informatics and communication methods to advocate for community public health programs and policies
(1.7): Evaluation	▪ Decision analyses (e.g., cost-effectiveness, cost-benefit, cost-utility) ▪ Quality improvement processes (e.g., Plan-Do-Study-Act cycle; clinical practice improvement; root cause analyses) ▪ Process and outcome assessments: measuring outcomes based on population health measures; compliance with legal and ethical principles ▪ Effects of political, social and economic policies on public health systems at the local, state, national and international levels	▪ Illustration of how changes in public health systems (including input, processes, and output) can be measured ▪ Impact of global trends and interdependencies on public health related problems and systems

Table 2 (cont.): Competency areas for integration of public health into didactic Pharm.D. curricula

CPPHC framework[12]	**Content Grade I** **(i.e. strongly recommended to be included in the required Pharm.D. curriculum)**	**Content Grade II** **(i.e. suggested for students pursuing advanced training such as MPH or minor in public health)**
Component 2: Clinical preventive services and health promotion		
(2.1): Screening	▪ Evidence-based recommendations ▪ Assessment of health risks (e.g., bio-psycho-social, environment) ▪ Concepts and skills involved in culturally appropriate community engagement and empowerment with diverse communities ▪ Identification of health risks in a given community appropriate for screening ▪ Approaches to testing and screening (e.g., range of normal, sensitivity, specificity, predictive value, target population) ▪ Appropriate clinician-patient communication (e.g., patient participation in health screenings, to include decision-making, informed consent, risk communication, advocacy, health literacy) ▪ Criteria for successful screening (e.g., effectiveness, benefits and harms, barriers, cost, acceptance by patient) ▪ Legislation/regulation affecting routine pharmacy and community-based screenings (CLIA, etc.) ▪ Government requirements (e.g., newborn screening)	▪ Limitations of public health screening programs
(2.2): Counseling for behavioral change	▪ Approaches to behavior change incorporating diverse patient perspectives (e.g., counseling skills, training, motivational interviewing) ▪ Behavior change and how patients approach lifestyle changes ▪ Clinician-patient communication (e.g., patient participation in decision making, informed consent, risk communication, advocacy, health literacy) ▪ Health promotion, covering "health, wellness, disease prevention, and management of diseases and medication therapies to optimize outcomes" ▪ Criteria for successful counseling for behavior change (e.g., effectiveness, benefits and harms, cost, acceptance by patient)	▪ Theory- and strategy-based communication principles across different settings and audiences

Table 2 (cont.): Competency areas for integration of public health into didactic Pharm.D. curricula

CPPHC framework[12]	**Content Grade I** **(i.e. strongly recommended to be included in the required Pharm.D. curriculum)**	**Content Grade II** **(i.e. suggested for students pursuing advanced training such as MPH or minor in public health)**
Component 2: Clinical preventive services and health promotion, cont.		
(2.3): Immunization	▪ Approaches to immunization and evidence-based recommendations for administration ▪ Clinician-patient communication (e.g., patient participation in decision- making, informed consent, risk communication, advocacy, health literacy) ▪ Criteria for successful immunization (e.g. effectiveness, benefits/harms, cost, acceptance) ▪ Completion of an immunization certification course ▪ Challenges to immunization of communities ▪ Government requirements	
(2.4): Preventive medicine	▪ Approaches to preventative medicine (pharmacologic, non-pharmacologic, primary and secondary) ▪ Role of preventative medicine in the overall health of a community ▪ Evidence-based recommendations ▪ Achieve medication-related public health goals ▪ Criteria for effective preventative medicine, including efficacy, barriers, costs, and patient acceptance	▪ Organizational and governmental initiatives for preventative medicine as well as the role of health policy ▪ Concepts of probability, random variation and commonly used statistical probability distributions. ▪ Social, behavioral, environmental, and biological factors contribute to specific individual and community health outcomes.
(2.5): Other preventive interventions	▪ Approaches to prevention (e.g., diet, exercise, smoking cessation) ▪ Criteria for successful preventive interventions (e.g., effectiveness, benefits and harms, barriers, cost, acceptance by patient) ▪ Evidence-based recommendations ▪ Health and wellness ▪ Emerging issues, products, and services that may affect the efficacy or quality of disease prevention services to amend existing or develop additional services ▪ Clinician-patient communication	

Table 2 (cont.): Competency areas for integration of public health into didactic Pharm.D. curricula

CPPHC framework[12]	**Content Grade I** **(i.e. strongly recommended to be included in the required Pharm.D. curriculum)**	**Content Grade II** **(i.e. suggested for students pursuing advanced training such as MPH or minor in public health)**
Component 3: Clinical practice and population health		
(3.1): Incorporating population health into clinical care	▪ Principles of patient and community engagement when seeking to achieve population health improvement ▪ Principles of healthcare team practice: roles and contributions, interprofessional team competencies ▪ Causes of social and behavioral factors that affect health of individuals and populations ▪ Coordination of health systems ▪ Influence of social determinants of health on clinical interventions (e.g., transportation, food deserts, green space, income, occupation, personal and cultural beliefs, health literacy) ▪ Population health assessment and improvement within a coordinated healthcare delivery system (e.g., safety assessments, coordinated care) ▪ Role of social and community factors in both the onset and solution of public health problems	
(3.2): Partnering with the public to improve health	▪ Health literacy and utilize this concept to create effective patient education and/or counseling ▪ Evidence-based recommendations for community preventive services ▪ Health information evaluation for literacy level and cultural appropriateness ▪ Strategies for using mass media and risk communication ▪ Methods of assessing community needs/strengths and options for intervention (e.g., community-oriented primary care)	▪ Individual, organizational, and community concerns and resources for public health programs in collaboration fashion
(3.3): Environmental health	▪ Scope of environmental health ▪ Environmental health risk assessment and risk management (e.g., genetic, prenatal) ▪ Sources, media, and routes of exposure to environmental contaminants (e.g., air, water, food) ▪ Environmental disease prevention focusing on susceptible populations	▪ Direct and indirect human, ecological and safety effects of major environmental and occupational agents ▪ Federal and state regulatory programs, guidelines and authorities that control environmental health issues

Table 2 (cont.): Competency areas for integration of public health into didactic Pharm.D. curricula

APTR CPPHC framework[12]	**Content Grade I** **(i.e. strongly recommended to be included in the required Pharm.D. curriculum)**	**Content Grade II** **(i.e. suggested for students pursuing advanced training such as MPH or minor in public health)**
Component 3: Clinical practice and population health, cont.		
(3.4): Occupational health	▪ Exposure and prevention in health care settings ▪ Employment-based risks/injuries ▪ Employee health programs (e.g., Asheville project) ▪ Methods for prevention and control of occupational exposures/injuries	▪ Governmental policies to reduce workplace risks and injuries
(3.5): Global health issues	▪ Role of international organizations in the provision and advocacy of health across the world ▪ Socio-economic impacts on health in developed and developing countries ▪ Health disparities ▪ Demographic changes (e.g., size and age of population, mortality and fertility rates) ▪ Successful measures to address key burdens of disease ▪ Major global health issues and the burden of morbidity and mortality ▪ Effects of globalization on health (e.g., emerging and reemerging disease/conditions, food and water supply ▪ Disease and population patterns as they relate to globalization	▪ Principles of cost-effectiveness, benefits and harms, and sustainability of a new intervention designed to improve global health
(3.6): Cultural dimensions of practice	▪ Clinician-patient communication (e.g., patient participation in decision-making, informed consent, risk communication, advocacy, health literacy) ▪ Cultural influences on individuals and communities (e.g., health status, health services, health beliefs) ▪ Culturally appropriate/sensitive health care ▪ Cultural competency ▪ Professional ethics and practices relate to equity and accountability in diverse community settings	▪ Principles of community-based participatory research to improve health in diverse populations ▪ Role of cultural competence in addressing health disparity
(3.7): Emergency preparedness and response systems	▪ Public health preparedness, including bioterrorism and disasters preparedness and management ▪ Roles and preparing the health system workforce ▪ Leadership skills for building partnerships. ▪ Strategies for building community capacity	▪ Evidence-based biological and molecular concepts to inform pubi.lc health laws, policies, and regulations

Table 2 (cont.): Competency areas for integration of public health into didactic Pharm.D. curricula

CPPHC framework[12]	**Content Grade I** **(i.e. strongly recommended to be included in the required Pharm.D. curriculum)**	**Content Grade II** **(i.e. suggested for students pursuing advanced training such as MPH or minor in public health)**
Component 4: Health systems and health policy		
(4.1): Organization of clinical and public health systems	▪ Clinical health services (e.g., ambulatory, home, hospital, long-term care, industry, etc.) ▪ Healthcare delivery systems ▪ Differences between health systems across the world, including key components of the Beveridge, Bismarck and National Health Insurance models. ▪ Relationships between clinical practice and public health (e.g., individual and population needs) ▪ Essential components of public health (e.g., three core functions of public health core and ten essential public health services) ▪ Structure of public health systems	▪ Core functions of assessment, policy development, and assurance in the analysis of public health programs and their solutions
(4.2): Health services financing	▪ Clinical services coverage and reimbursement ▪ Pharmacoeconomics ▪ Healthcare for the uninsured or underinsured ▪ Different methods for financing health care institutions and public health services ▪ Other models (e.g., international comparisons) ▪ Ethical frameworks for healthcare financing	▪ Principles of program planning, development, budgeting, management, and evaluation in organization and community initiatives
(4.3): Clinical and public health workforce	▪ Types of regulation of health professionals and health care institutions ▪ Role of pharmacist as part of the healthcare team and the interprofessional team approach ▪ History, philosophy, roles and responsibilities of the pharmacy profession ▪ Racial/ethnic workforce composition; minorities ▪ Legal/ethical responsibilities of health care professionals	
(4.4): Health policy process	▪ Process of health policy making (e.g., local, state, federal government) ▪ Methods for participation in the policy process (e.g., advocacy, advisory processes, opportunities and strategies to impact policy and public health problems) ▪ Development of drug use and health policy and promote the availability of effective health and disease prevention services and health policy ▪ Emerging issues, products, and services that may affect public health policy, to amend existing or develop additional policies ▪ Consequences of being uninsured or underinsured ▪ Impact of policies on health care and health outcomes ▪ Ethical framework for public health decision-making	▪ Health policy and management issue communication using appropriate channels and technologies

Table 3: Competency areas for integration of public health into experiential Pharm.D. curricula

CPPHC framework[12]	**General approaches**	**Patient-centered ("micro" level) → population-based ("macro" level)**			
		Ambulatory care pharmacy practice	**Community pharmacy practice**	**Hospital and health-system pharmacy practice**	**Population-focused and public policy agencies**
Component 1: Foundations of population health					
(1.1): Descriptive epidemiology: the health of populations	▪ Literature searches to understand incidence, prevalence, morbidity, and mortality of disease and health data statistics relevant to the practice setting	▪ Social determinants of health and health data/statistics ▪ Epidemiologic principles to develop various health programs/interventions		▪ Impact and importance of infection control/antibiotic stewardship programs ▪ Infection control/antibiotic stewardship programs or attend related meetings	▪ Local and regional disease/infection trends ▪ Program needs assessment related to local and regional disease/infection trends
(1.2): Etiology, benefits and harms: health research evaluation	▪ Principles of study designs and data analysis	▪ Principles of study designs through practice-related journal club			▪ Principles of study designs through population health-related journal club and health policy analysis
(1.3): Evidence-based practice	▪ Critical thinking and skills in evidence-based medicine	▪ Evidence-based justification for patient care recommendations			▪ Evidence-based justification for public health policy and programs or proposals
(1.4): Implementation of health promotion and disease prevention interventions	▪ Program development, implementation and evaluation	▪ Appropriate levels of and targets for prevention; also apply strategies for intervention and plan for evaluation		▪ Targeted programs and populations based on problem description/descriptive epidemiology activities. Assist in the implementation of programs	

Table 3 (cont.): Competency areas for integration of public health into experiential Pharm.D. curricula

CPPHC framework[12]	General approaches	Patient-centered ("micro" level) → population-based ("macro" level)			
		Ambulatory care pharmacy practice	**Community pharmacy practice**	**Hospital and health-system pharmacy practice**	**Population-focused and public policy agencies**
Component 1: Foundations of population health, cont.					
(1.5): Determinants of health	▪ Techniques in health promotion and disease prevention	▪ Patient counseling in behavioral changes for health (e.g., smoking cessation, diet/exercise, etc.) ▪ Immunization need evaluation ▪ Disadvantaged patients and assistance in accessing social support programs or obtaining healthcare insurance		▪ Trends and contributors to antimicrobial resistance within and across institutions	▪ Health screenings, medication/disease education in outreach settings
(1.6): Population health informatics	▪ Epidemiological healthcare data	▪ Use of prescription claims data in improving the quality of prescribing ▪ Potential for errors and alert fatigue with the use of electronic healthcare software and technology		▪ EMRs to perform clinical audits to improve institutional practices ▪ Adverse event and medication error reporting	▪ Research using publicly available databases (e.g., NHANES, MEPS, HCUP, etc.)
(1.7): Evaluation	▪ Pharmacoeconomic data to guide clinical use	▪ Formulary development and examples of data used to facilitate these decisions		▪ Development of decision analyses for P&T committee assessments ▪ Root cause analyses for medication errors or adverse events	▪ Research on cost-effectiveness of clinical regimens and interventions

Table 3 (cont.): Competency areas for integration of public health into experiential Pharm.D. curricula

CPPHC framework[12]	General approaches	Patient-centered ("micro" level) → population-based ("macro" level)			
		Ambulatory care pharmacy practice	**Community pharmacy practice**	**Hospital and health-system pharmacy practice**	**Population-focused and public policy agencies**
Component 2: Clinical preventive services and health promotion					
(2.1): Screening	▪ Research on clinical guidelines and screening re-commendation ▪ Health screening services	▪ Screening provided in ambulatory care setting specific to state scope of practice ▪ Health screening services ▪ Compliance rate of practitioners to screening guideline recommendations (i.e. pay for performance ratings)	▪ Screenings often provided in community pharmacy specific to state scope of practice ▪ Health screening services (e.g., diabetes and/or cardiovascular risk, osteoporosis, etc.) ▪ Specific national monthly health observances into screening events (e.g. Diabetes Awareness Month)	▪ Routine, required screenings in hospital (e.g., newborn screenings) ▪ Compliance rate of hospital with required screening procedures ▪ Policy and procedures for screening and reporting ADR and medication safety/errors (ISMP) ▪ Medication reconciliation	▪ Policies in place related to screenings ▪ Planning and implementation of screening services ▪ Public health agency collaboration to design and implement screening services to the community
(2.2): Counseling for behavioral change	▪ Counseling strategies and techniques to improve patient-provider communication, relationships, and health outcomes.	▪ Counseling for behavioral change in direct patient care encounters (e.g., smoking cessation, lifestyle modifications) ▪ Motivational interviewing when applicable.		▪ Patient discharge counseling ▪ Behavioral change through motivational interviewing ▪ Lifestyle change counseling (e.g., cardiac patients)	▪ Guidelines for implementing behavioral change counseling ▪ Use of health behavior theories and models (e.g., Health Belief Model) ▪ Training and support for behavior change counseling

Table 3 (cont.): Competency areas for integration of public health into experiential Pharm.D. curricula

CPPHC framework[12]	General approaches	Patient-centered ("micro" level) → population-based ("macro" level)			
		Ambulatory care pharmacy practice	**Community pharmacy practice**	**Hospital and health-system pharmacy practice**	**Population-focused and public policy agencies**
Component 2: Clinical preventive services and health promotion, cont.					
(2.3): Immunization	▪ Pharmacist/student pharmacist scope of practice (influenza, pneumococcal, etc.) depending on state	▪ Pre- and post-counseling/education and assist in immunization efforts (e.g. influenza vaccination clinics). ▪ Immunizations if allowed by site or scope of practice ▪ Immunization education to the community and referrals, as needed ▪ Education to health professionals about immunizations ▪ Awareness of CDC guidelines and recommendations for vaccinations ▪ Efforts to increase health care workers immunization	▪ Pre- and post- counseling education and assist in immunization efforts (e.g. influenza vaccination clinics) ▪ Immunizations if allowed by site or scope of practice ▪ Immunization education to the community, and referrals, as needed ▪ Advocacy efforts to expand types of immunizations in community setting	▪ Immunization protocols of hospital (for patients and employees) ▪ Awareness promotion of importance of health care workers immunization ▪ Compliance rates of the health system to the immunization protocols. ▪ Education to health professionals about immunizations ▪ Immunizations if allowable by state and institution ▪ Awareness of CDC guidelines and recommendations for vaccinations ▪ Systems to support micro-level interventions ▪ Efforts to increase health care workers immunization	▪ Immunizations available through the public health agency ▪ Immunization-related policies and resources supported by the agency ▪ Immunizations if allowable by state and agency ▪ Immunization-related advocacy efforts ▪ Global health/travel vaccine clinic ▪ Education to health professionals about immunizations ▪ Systems to support micro-level interventions

Table 3 (cont.): Competency areas for integration of public health into experiential Pharm.D. curricula

CPPHC framework[12]	General approaches	Patient-centered ("micro" level) → population-based ("macro" level)			
		Ambulatory care pharmacy practice	**Community pharmacy practice**	**Hospital and health-system pharmacy practice**	**Population-focused and public policy agencies**
Component 2: Clinical preventive services and health promotion, cont.					
(2.4): Preventive medication	▪ Current practice guidelines regarding preventive medications ▪ Protocols and OSHA blood borne pathogens	▪ Medications used for preventive measures (e.g. folic acid in pregnancy, calcium/Vitamin D, aspirin for primary CVD prevention) ▪ Education about preventive antivirals ▪ Education about evidence-based preventive medication (vs. non FDA-approved products) ▪ Awareness and involve in medication safety initiatives		▪ Pre-post exposure prophylaxis (OSHA blood borne pathogens standard) ▪ Chemoprevention (nausea/vomiting) ▪ Awareness and involvement in medication safety initiatives	▪ Strategies for promoting awareness and involvement in medication safety
(2.5): Other preventive interventions	▪ Criteria for successful preventive interventions (e.g., effectiveness, benefits and harms, barriers, cost, acceptance by patient)	▪ Clinician-patient communication (e.g., patient participation in decision-making, informed consent, risk communication, advocacy, health literacy)	▪ Approaches to prevention (behavioral change counseling) ▪ Medication safety (identify LASA drugs; implement common labeling) ▪ Processes used to prevent medication errors	▪ Clinician-patient communication (e.g., patient participation in decision-making, informed consent, risk communication, advocacy, health literacy)	▪ Criteria for successful preventive interventions (e.g., effectiveness, benefits and harms, barriers, cost, acceptance by patient) ▪ Strategies for promoting awareness and involvement in health advocacy, health literacy, cultural competence and medication safety

Table 3 (cont.): Competency areas for integration of public health into experiential Pharm.D. curricula

CPPHC framework[12]	General approaches	Patient-centered ("micro" level) → population-based ("macro" level)			
		Ambulatory care pharmacy practice	**Community pharmacy practice**	**Hospital and health-system pharmacy practice**	**Population-focused and public policy agencies**
Component 3: Clinical practice and population health					
(3.1): Incorporating population health into clinical care	▪ Shadowing of community and lay workers such as patient navigators and community health workers ▪ Participation as member of an interprofessional team ▪ Patient safety assessments ▪ Influence of social determinants of health on clinical interventions	▪ Coordination of care for groups of patients with chronic diseases ▪ Coordination with the community, the public health system, community-based programs, and across the healthcare system	▪ Coordination with the community, the public health system, community-based programs, and across the healthcare system	▪ Coordination with the community, the public health system, community-based programs, and across the healthcare system	▪ Community involvement ▪ Engagement of patients in the critical review of health-related news and information
(3.2): Partnering with the public to improve health	▪ Health information to ensure accuracy as well as appropriate cultural and health literacy level for the patients/public	▪ Health information for patients in public/waiting areas and for direct provision to patients (e.g., bulletin boards, monitors, public/waiting areas, pamphlets, etc.)	▪ Health information materials provided in public areas and to patients of the hospital for readability (e.g., pamphlets, posters, discharge plans, etc.)	▪ Appropriateness and readability of health information materials of the agency (including media communications) ▪ Media campaign	▪ Health information to ensure accuracy as well as appropriate cultural and health literacy level for the patients/public

Table 3 (cont.): Competency areas for integration of public health into experiential Pharm.D. curricula

CPPHC framework[12]	General approaches	Patient-centered ("micro" level) → population-based ("macro" level)			
		Ambulatory care pharmacy practice	**Community pharmacy practice**	**Hospital and health-system pharmacy practice**	**Population-focused and public policy agencies**
Component 3: Clinical practice and population health, cont.					
(3.3): Environmental health	▪ Environmental health risk assessment and management at rotation sites	▪ Environmental health risk assessment at the clinic ▪ Identification of strategies for risk management	▪ Environment assessment at the pharmacy or store ▪ Identification of strategies for risk management	▪ Environmental health risk assessment of the facility ▪ Identification of strategies for risk management	▪ Environmental health issues research prevalent in the local area and state ▪ Public education programs regarding how one can decrease risk of exposure
(3.4): Occupational health	▪ OSHA requirements	▪ Policies and procedures regarding workplace safety at the clinic, pharmacy, or hospital			▪ Educational materials and/or policies and procedures regarding occupational health for the agency to distribute to workplaces
(3.5): Global health issues	▪ Disparities in health/healthcare in the US ▪ International approaches to health care and public health issues	▪ Clinics within the US and the US to other parts of the world ▪ Global health/travel vaccine clinic if applicable	▪ Community pharmacies, role of pharmacists, and medication distributions within the US and the US to other parts of the world ▪ Drug names in US and other countries	▪ Health-system policy for management of high risk infectious diseases and other conditions not prevalent in local region (e.g., tropical diseases)	▪ International health organizations and health issues in other parts of the world ▪ US disease and population patterns compared to other countries
(3.6): Cultural dimensions of practice	▪ Cultural competency principles and practices ▪ Culturally and Linguistically Appropriate Services (CLAS) standards to the site as relevant	▪ Cultural competency principles and practices ▪ CLAS standards to the clinic or pharmacy as relevant		▪ Health-system policies regarding culturally sensitive care ▪ CLAS standards to the hospital as relevant	▪ Public health policies in local communities compared to others from different regions or cultures to compare/contrast cultural influences on delivery of care ▪ Awareness and use of the CLAS standards in variety of settings

Table 3 (cont.): Competency areas for integration of public health into experiential Pharm.D. curricula

CPPHC framework[12]	General approaches	Patient-centered ("micro" level) → population-based ("macro" level)			
		Ambulatory care pharmacy practice	**Community pharmacy practice**	**Hospital and health-system pharmacy practice**	**Population-focused and public policy agencies**
Component 4: Health systems and health policy					
(4.1): Organization of clinical and public health systems	▪ Three core functions and ten essential services of public health ▪ Relationships between clinical and public health	▪ Organizational structure of ambulatory care clinics within a health-system. ▪ Types of clinics (e.g., community health centers, safety net, private, etc.) ▪ Funding and policies of clinics regarding continuity of care	▪ Types and reporting structures of community pharmacies, especially if it is part of an outpatient pharmacy within a health-system ▪ Funding, if applicable, business model, and policies	▪ Policies and related infrastructure at the hospital (focus on patients and health care workers of the institution) ▪ Intake and discharge procedures ▪ Policies designed to support continuity of care	▪ Local, state, and federal public health administration, structure, and policies ▪ US public health systems levels (e.g., local, state, federal) and its linkage to others
(4.2): Health services financing	▪ Models, systems, and mechanisms for health care services financing and delivery	▪ Processes to obtain funding for health care services delivery (e.g., incident-to-physician billing, point-of-care, MTM services)	▪ Processes to obtain funding for health care services delivery (e.g., MTM services)	▪ Pharmacist service reimbursement at the health system ▪ Patient assistance programs ▪ P&T Committee	▪ Grants proposal and routing ▪ Financing processes of public health services at the agency/entity ▪ Processes to obtain funding for health care services delivery

Table 3 (cont.): Competency areas for integration of public health into experiential Pharm.D. curricula

CPPHC framework[12]	General approaches	Patient-centered ("micro" level) → population-based ("macro" level)			
		Ambulatory care pharmacy practice	**Community pharmacy practice**	**Hospital and health-system pharmacy practice**	**Population-focused and public policy agencies**
Component 4: Health systems and health policy, cont.					
(4.3): Clinical and public health workforce	▪ Legal/ethical responsibilities related to the health-system (e.g., liability, HIPAA) ▪ Role of different healthcare professional workforce issues	▪ Regulatory aspects to ensure compliance and competence of health care workers at the practice site		▪ Different levels of practitioners and required certifications/licensure and their role in public health (can interview individuals) ▪ Interdisciplinary efforts related to public health	▪ Structure and team members and their role as health care workers at the site
(4.4): Health policy process	▪ Process of health policy development and implementation at different levels ▪ Health policy analysis	▪ Site-specific policies as part of the larger health system ▪ Policy process and development ▪ Criteria for health policy analysis	▪ Site-specific policies as part of the larger health-system	▪ Policy meetings of the institution ▪ Background literature reviews for proposed policy topics ▪ Site-specific policies as part of the larger health system ▪ Policy process and development	▪ Site-specific policies as part of the larger health system ▪ Policy process and development ▪ Criteria for health policy analysis ▪ Health policy analysis

VII. Appendices

Appendix 1: Example learning objectives for public health topics in the Pharm.D. curriculum

- Compare and contrast individual health, population health, and public health.
- Perform health prevention and health promotion activities with individual patients and at-risk populations.
- Retrieve, analyze, and interpret lay and scientific literature to provide public health information to the public.
- Develop a disease management program based on analysis of epidemiologic data.
- Describe the role of pharmacy in advocating for policy that can improve health of vulnerable populations.
- Discuss the historical roots of the field of public health and how the field has adapted in modern society.
- Describe essential healthcare services provided through public health programs.
- Critique the structure of the US healthcare system and where improvements are needed.
- Discuss the role of pharmacists in ensuring drug safety within the US healthcare system.
- Identify major organizations involved in the delivery of public health services in the US and worldwide.
- Discuss the differences between and examples of primary, secondary and tertiary prevention.
- Describe how genetics, environment and social situation influence health.
- Identify how socioeconomic status relates to health inequalities.
- Identify opportunities where pharmacists may contribute or collaborate in the delivery of public health services.
- Evaluate the feasibility of certain health interventions in resource-limited areas.
- Demonstrate communication skills appropriate to a patient's culture, religion, and language.
- Explain the process for emergency response for public health on the regional, national and international level.
- Define common study design terminology such as case-control, cohort, randomized controlled trials, cross-sectional analysis, case reports/series, intention-to-treat, etc.
- Explain the meaning of significance and the interpretation of p-values.
- Determine the different types of bias and how it may influence the results of a study.
- Calculate and interpret relative risks, odds ratios, and number needed to treat for a given study scenario.
- Define principles of pharmacoeconomics and calculate and interpret pharmacoeconomic analyses.
- Discuss applications of economic theories and health-related quality-of-life concepts to improve allocation of limited health care resources.
- Critically appraise published pharmacoeconomic studies.
- Utilize tools needed to assess and address change, improve quality, and optimize patient services.
- Explain healthcare improvement mechanisms at the micro- and macro-system levels.
- Describe problems associated with overuse, underuse, and misuse in the US healthcare system and the use of data in continuous quality improvement initiatives.
- List and describe organizations devoted to assurance and advancement of quality health care.
- Identify quality/outcomes indicators that could be used in evaluating a specific pharmacy service or program.
- Apply principles of epidemiology to the study of drug use and outcomes in populations (pharmacoepidemiology)
- Describe rationale and methods for continual monitoring for unwanted effects and other safety-related aspects of drugs (pharmacovigilance) and for risk minimization (RiskMAPS and REMS programs).
- Describe the importance of involvement and advocacy in regulatory, state, and federal issues; identify issues, pending legislation and regulations at local, state, and federal levels and how to make a positive impact.
- Define cultural competency and its importance, as well as characteristics of culturally-competent professionals.
- Explain different theories of disease causation.
- Describe commonly-observed health beliefs and practices among various cultures in the US.
- List barriers to effective cross-cultural communication.
- Describe, compare and contrast the models that can be used in effective cross-cultural communication.
- Define "health literacy" and the subtypes; contrast with "literacy".
- Explain the prevalence and consequences of low health literacy.

Appendix 2: ADAPT instrument

Excerpted from [47]

Assessment, Development, Assurance: Pharmacist's Tool (ADAPT)

Truong HA, Taylor CR, DiPietro NA

This comprehensive and validated assessment instrument is based on the framework of 3 core functions of public health, including assessment, (policy) development, and assurance (Institute of Medicine) and 10 essential public health services (Centers for Disease Control and Prevention). The ADAPT instrument's 15-minute, 36-item checklist aims to assist pharmacists, faculty advisors, preceptors, and student pharmacists to systematically plan and implement health promotion activities during Introductory Pharmacy Practice Experiences (IPPEs), Advanced Pharmacy Practice Experiences (APPEs), and service learning or community outreach programs. Recommendations and resources are also provided for effective and quality health programs.

Please complete the assessment instrument by selecting "Yes," "No," or "Not Applicable (N/A)" for each item below. To ensure effective and quality health promotion program planning and implementation, all items should be checked as "Yes" prior to or during the planning stage of the program. "Not Applicable" ("N/A") may be utilized for items not pertinent to program. If "No" is selected for a particular item, program planners should resolve the issue before instituting the intervention. The program should be reviewed prior to implementation and at least annually thereafter to ensure that the latest information and evidence-based public health is incorporated into the intervention.

Definitions for assistance with the completion of this assessment tool:

"Participant" refers to patients or a population for whom a "program" is being targeted or planned for improving public health.
"Program" refers to a public health activity or intervention aiming at improving the health of a targeted patient population.
"Program planners" refer to student pharmacists and faculty advisors or preceptors developing or supervising a "program" as defined above.

Proposed Health Promotion Program Name: _____ **Date:** _____ **Program Planner(s):** _____

Assessment	Yes	No	N/A
Monitor health status to identify and solve community health problems.			
1. Program planners have completed or identified at least one of the following: a. A needs assessment or consultation with community members and stakeholders to identify health status, including risks or problems, of a community b. Health risks or problems (e.g. environment, hazards, etc.) present in a community c. Health statistics, literature searches, etc. which demonstrate the need for an intervention.	◯	◯	◯
2. Program planners have identified and prioritized a health risk or problem for intervention in a specific population.	◯	◯	◯
3. Program planners have identified and recruited committed members for the program implementation team.[1]	◯	◯	◯
Diagnose and investigate health problems and health hazards in the community			
4. The specific or target population has been identified.[2]	◯	◯	◯
5. The selected health risk or problem in the target population is relevant or has timely need for intervention.	◯	◯	◯
6. Demographics (e.g. age, educational level, health literacy, cultural aspects, religious beliefs, etc.) of the target population are identified.	◯	◯	◯
7. Determinants of health (e.g. socioeconomic status; possible disparities due to patient age, gender, and culture; other factors affecting health status) of the target population are identified.	◯	◯	◯

Appendix 2 (cont.): ADAPT instrument

Excerpted from [47]

(Policy) Development	Yes	No	N/A
Inform, educate, and empower people about health issues.			
8. The program includes a mission statement, goals, and objectives to inform, educate and empower the target population about the specific health issue.	◯	◯	◯
9. Program planners have appropriate materials (e.g. written materials) for the program including: a. Materials obtained from a credible source (e.g. American Heart Association, American Diabetes Association, American Public Health Association, etc.) that are appropriately created for the identified participants and aligned with the goals for the program. b. Materials that are developed by program planners contain the following information as appropriate.[1-3]	◯	◯	◯
i. Introduction to the disease state, medical condition, or health maintenance issue (e.g. immunizations)	◯	◯	◯
ii. Natural history of disease (explanation or timeline of disease state progression) and risks for complications	◯	◯	◯
iii. Modifiable and non-modifiable risk factors (e.g. lifestyle changes, family history)	◯	◯	◯
iv. Preventive measures of health risks or problems	◯	◯	◯
v. Signs and Symptoms	◯	◯	◯
vi. How to react to positive signs and symptoms • When to seek immediate medical attention (i.e. call 9-1-1) • When to see a healthcare professional • When to self-treat	◯	◯	◯
vii. How to properly use home testing and monitoring devices (e.g. blood glucose monitor, automatic blood pressure cuff, etc.) and interpret results or take action on results.	◯	◯	◯
viii. Non-pharmacologic (e.g. lifestyle modifications) and/or pharmacologic treatment options.	◯	◯	◯
ix. Available resources for follow-up actions.	◯	◯	◯
c. Written materials appear in a large, clear, easy-to-read format.	◯	◯	◯
d. Pictures or diagrams complement the written materials in the program.[2]	◯	◯	◯
e. Materials do not contain medical jargon (e.g. hypertension, hyperlipidemia, etc) and "Do Not Use" terms or abbreviations (e.g. qd, once, etc.).[2]	◯	◯	◯
f. All abbreviations/symbols (e.g. HTN, BG, MAP, etc.) are defined and explained throughout the program.	◯	◯	◯
10. Program planners have appropriate medical supplies (e.g. stethoscope, blood pressure cuffs, glucometers, etc.) or funding available to address the identified health risk or problem.	◯	◯	◯
11. Program planners have arranged for appropriate audio-visual or other equipment necessary for program implementation (e.g. laptops, screen projector, internet, tables or chairs).	◯	◯	◯
Mobilize community partnerships to identify and solve health problems.			
12. It is anticipated that the community members and stakeholders will receive or accept the program (i.e. age appropriate, culturally appropriate etc.)[2]	◯	◯	◯
13. Involvement of the target population has been sought via promotional materials, advertising, etc.[2]	◯	◯	◯
Develop policies and plans that support individual and community health efforts.			
14. The program addresses or supports current national, state, or local priorities or initiatives or public or private organizations.	◯	◯	◯

Appendix 2 (cont.): ADAPT instrument

Excerpted from [47]

15. The program has a mission or supports the mission of the institution or organization (e.g. college or school of pharmacy, state association, agencies, etc.) to improve public health.	◯	◯	◯
16. Program planners should consider whether the program has potential for: a. Policy development and/or legislation to improve community's health. b. Funding/grants to improve community's health. c. Sustainability to improve community's health. *If so, program planners are strongly encouraged to pursue these opportunities.*			
Assurance	**Yes**	**No**	**N/A**
Enforce laws and regulations that protect health and ensure safety.			
17. The program is legally permitted by and compliant with state/federal regulations.	◯	◯	◯
a. The program operates within the state's scope of practice for pharmacists, student pharmacists, or pharmacy interns.	◯	◯	◯
i. Program team members have a valid pharmacy intern's license as required.	◯	◯	◯
ii. Licensed pharmacist(s) will be present during implementation team training and at the time of the program.	◯	◯	◯
b. Team members have appropriate certifications (e.g., BLS/CPR, immunization) as required.	◯	◯	◯
c. Team members have appropriate liability insurance as required.	◯	◯	◯
d. The program has standard procedures or protocols (e.g. standing orders for immunization) as required.	◯	◯	◯
e. The program is organized in a way that will ensure the privacy of all participants and will avoid HIPAA violations.	◯	◯	◯
18. The program provides informed consent/waiver forms for participants.	◯	◯	◯
19. The program has received institutional review board (IRB) approval if required.	◯	◯	◯
20. The program team members or participants may be exposed to bodily fluids. (If yes, go to item #20a; if no, go to item #21.)	◯	◯	◯
a. All laboratory tests to be used are waived under the Clinical Laboratory Improvement Amendment (CLIA).	◯	◯	◯
b. OSHA blood borne pathogen training has been completed by all members of the program team.	◯	◯	◯
Link people to needed personal health services and assure the provision of health care when otherwise unavailable.			
21. The health literacy level of the target population will be considered when developing and implementing the program.*	◯	◯	◯
22. Program planners consult resources for patient health literacy education.*	◯	◯	◯
23. Program planners will provide written results (i.e. forms with results of screenings or tests) for participants to take and share with personal healthcare professional(s).	◯	◯	◯
24. Program planners provide referral resources and encourage utilization of those by participants for follow-up actions (e.g. how to access to healthcare professionals, clinics, medication assistance programs, and other health resources)	◯	◯	◯
Assure Competent Workforce.			
25. The program implementation team is trained to deliver the program to the target population.[1,2]	◯	◯	◯
26. The program implementation team is trained to interpret results of screenings or tests and triage as appropriate.	◯	◯	◯
27. The program implementation team has clear and well-documented procedures or protocols to deliver the program.	◯	◯	◯
Evaluate effectiveness, accessibility, and quality of personal and population-based health services.			
28. The program is based on health behavior theories or models, evidence based medicine, and/or best practice[2]	◯	◯	◯

Appendix 2 (cont.): ADAPT instrument

Excerpted from [47]

29. The program has established goals and objectives with reasonable and measurable outcomes.[1]	◯	◯	◯
30. The program content, language, and delivery is appropriate based on the target population demographics and health literacy level.	◯	◯	◯
31. The program considers a standard tool for ensuring cultural competence (e.g. US DHHS Office of Minority Health – National Standards on Culturally and Linguistically Appropriate Services (CLAS)[4] to include at least some components of the following where applicable or necessary: a. Offers and provides language assistance services, including bilingual staff/interpreter services at no cost for patient. b. Provide to patients in their preferred language both verbal and written notice informing them of their right to receive language assistance. c. Ensure the competence of the language assistance provided. d. Make available easily understood patient-related materials and post signage in the predominant languages of the service area.	◯	◯	◯
32. The program has an appropriate and reasonable assessment or evaluation plan (e.g. meeting the needs of the target population, appropriate settings, effective communications, etc.) after implementation.[1,2] Future iterations of the program should be revised based on evaluations.	◯	◯	◯
33. Program includes mechanism for participant feedback (e.g. satisfaction survey) to improve future program based on feedback.	◯	◯	◯
34. Program implementation team has tools to document or record the number of people impacted by the program based on specific metrics (e.g. number of participants educated, number of participants screened, number of participants referred, participant demographics, etc.)	◯	◯	◯
Research for new insights and innovative solutions to health problems.			
35. Analysis of the impact of the program for evaluation and improvement of future initiatives (e.g. number of participants educated, screened, and/or referred; participant demographics, etc.) occurs after the program.	◯	◯	◯
36. Consider whether the program has potential for public health research. *If so, program planners are strongly encouraged to pursue opportunity and follow appropriate steps (e.g. IRB approval, etc.)*			

Proposed Health Promotion Program Name: _____ **Date:** _____ **Program Planner(s):** _____

Comments/Notes: _____

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*For items/questions 21 and 22, available resources/tools for assessing health literacy may include the U.S. Department of Education National Assessment of Adult Literacy (NAAL) Health Component section, "Teach-Back" education method, or prime questions for patient counseling. Additional resources may include American Medical Association Foundation "Health Literacy Toolkit," Health Resources and Services Administration "Unified Health Communication 101: Addressing Health Literacy, Cultural Competency, and Limited English Proficiency," Institute for Healthcare Advancement's Health Education Literacy Program (HELP).

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