The Interaction of Public Health and Primary Care: Functional Roles and Organizational Models that Bridge Individual and Population Perspectives.

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ABSTRACT

Introduction: Public health and primary care are often conceived as two entities providing complementary services within the health system. This scoping review aims to better understand how the two sectors interact by identifying their shared functions, and by identifying organizational models that could facilitate the interaction between the two domains.
Methodology: We conducted a review of published literature using PubMed and CINAHL journal indices. Our search yielded 179 articles. We reviewed abstracts and retained 55 relevant articles. We developed an extraction grid, based on a conceptual framework of functions of public health and primary care, in order to evaluate the relevance of selected articles, classify the information according to their functional connection, and identify interactions between them.
Results: Our search identified various activities through which public health can contribute to more effective primary care, and functions usually performed by primary care that seemed to support a population health approach. Most authors identified screening and immunization as actions that are carried out in primary

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care, but that can benefit from the support of public health. Health promotion and lifestyle modification are also shared responsibilities that can take the form of collective or individual intervention. The surveillance and protection function of public health, which actually takes place in primary care, consists of case identification for prevention or early treatment. Primary care is the setting where patients present, whereas public health has the role of investigation and of providing advice to clinical settings. Planning and evaluation are also emerging activities that concern both public health and primary care. Many authors recognized that public health provides tools that enhance the planning of primary care activities and are more aligned with the actual needs of populations. Others noted that public health is able to assess primary care in light of the changing health of populations, which may lead to better results for groups of patients.

Conclusion: One of the routes to a better understanding of how public health and primary care organizations can better interact is to identify the different contexts in which they collaborate successfully. Our scoping review of the scientific and gray literature identified various ways by which public health and primary care either reinforce each other through their respective functions, or increasingly act in a collaborative manner to increase population health and improve health systems performance.

Key Words: Public health, primary care, population health approach, system performance

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INTRODUCTION

Public health and primary care are often understood to be two entities providing complementary services within the health system, given that both aim to address health problems that are common in communities.[1-4] Public health may be defined as "the art and science of preventing disease, prolonging life and promoting health through the organized efforts of society"[1] and includes activities encompassing all organized efforts to promote, protect and improve, and when necessary, restore the health of individuals, specific groups, or populations.[2] Its functions mainly focus on population-based services and include surveillance and analysis of the population's well-being, including health status and determinants; health protection and the control of risk factors and diseases; prevention of diseases, injuries and social problems; promotion of health and well-being; the development and implementation of regulations, legislation and public policies that have an impact on health; research and innovation, including production, dissemination and application of scientific knowledge;

and development and maintenance of skills and competencies.[5] Other suggested functions include aid in the planning of services and evaluation of their impacts from a population perspective,[6,7] supporting community participation, and ensuring equity in access.[8]

Primary care is described as the first point of entry into the health care system. It is responsible for the provision and delivery of first-contact, person-centered, longitudinal, comprehensive, and coordinated care.[9-11] Primary care represents one of the health sectors, alongside public health, that interacts regularly with the majority of the population. Depending on the local context, it often includes disease prevention and treatment of common diseases and injuries, screening and early diagnosis, treatment, and palliative care. A well-developed primary care system creates benefits in terms of population health, with the reduction of avoidable morbidities and mortality, and hospitalizations.[12]

Despite the fact that public health and primary care are often conceptualized, organized, and funded as two separate entities, there is an emerging consensus that strengthening primary care can support some public health functions and that public health can in return enhance the provision of population-wide primary care. A health system based on a strong primary care infrastructure and a strong public health sector, each with carefully defined complementary roles, appears necessary in order to achieve the optimum health of the population and individual patients.[3]

This perceived need for increased interaction between primary care and public health takes root in epidemiological, economic, and technological change. The rise in chronic non-communicable diseases generates health problems that are relevant for both sectors. Prevention, early detection, treatment and management of chronic diseases and risk factors in aging populations therefore requires increased collaboration between primary care and public health. Escalation of health care costs are forcing stakeholders to explore innovative ways to increase efficiency and value for money.[3] Therefore, the need for prioritization implies recognition of the respective contributions of public health and primary care in providing services that respond to local needs. This is consistent with evidence that indicates that increased performance of primary care (e.g., enhanced access to care, increased utilization by underserved populations, improved primary care infrastructures) reduces health care costs through improvement of health outcomes and reduction of health disparities.[13] Finally, advances in genetic, diagnostic, therapeutic, and information technologies generate greater capacity to identify health problems and individualize treatments. These processes require a better understanding of the epidemiology of disease and the impact of the organization of services.

Based on comprehensive literature reviews, recent task forces have advocated for more effective interaction between these two sectors.[2,3] Various health system reforms and reorganizations aim to encourage this interaction by establishing structures bridging primary care with other sectors of care provision and by integrating a population perspective into the planning and delivery of its services. Public health policies are increasingly connected to primary care delivery in the community and to the overall governance of health systems and the design of public policies, which, until recently, were not considered to fall under the domain of public health (e.g., urban planning). Several challenges to this interaction include: competing priorities and mandates in both sectors; differences in targets (individuals *vs.* populations); a cultural dominance of the curative approach; and public expectations which promote investments in specialized curative services at the expense of more basic preventive services. In addition, recent trends have seen public health practitioners move from a generalist approach to a specialist approach focusing on specific diseases, determinants, or types of activities.[14] Some may consider a physician who adopts a specialized approach to be in conflict with the main role of primary care.

However, the ways in which the interaction between public health and primary care becomes embedded in broader service delivery, and the potential benefits associated with such an increased interaction, remain limited. This scoping review aims to better understand how public health and primary care interact by identifying their shared functions and by identifying organizational models that could facilitate such an interaction.

METHODOLOGY

We conducted a scoping review using the PubMed and CINAHL indices searching back to 1980 for articles in English or French that contained the keywords or MESH terms related to "Integration," "Collaboration," "Public Health," "Primary Care," "Primary Health Care," "Public Health Functions" and "Primary Care Functions," as well as various synonyms to cover the full spectrum of terms related to the interaction between public health and primary care. Our literature search yielded 179 articles. Recent review articles, reports published in the gray literature and journal supplements enabled us to expand the search and confirm the inclusion of the most important papers. We used a restricted number of MESH terms since the overall aim of this review was principally to identify main functions and models in order to analyze the interaction between primary care and public health, rather than to perform a comprehensive literature review. As such,

a "saturation effect" was observed during the process, indicating that we had likely identified the most significant publications. We reviewed the abstracts during the first level screening and eliminated articles that were not related explicitly to the subject of interaction between public health and primary care. We retained and analyzed 52 articles, and after the initial literature search, added three more recently published articles, for a total of 55 articles.

We developed an extraction grid, based on a conceptual framework of public health and primary care functions, in order to evaluate the relevance of selected articles, classify the information according to its link with public health or primary care responsibilities, and to identify interaction between public health and primary care (see Appendix 1). This extraction grid was based on a recent proposal of public health functions[4] and a widely recognized conceptualization of primary care roles.[10] Each paper was assessed by two independent readers and the content systematically classified using the extraction grid. We used NVivo software to assist with the analysis of the extracted information. Each author identified themes as they read the selected articles. These themes were discussed during meetings between the co-authors, and during the writing and revision of this paper. The reviewers were largely in agreement with the general selection criteria (overall perspective, quality of arguments, and relevance). There was some variability between authors as to the ranking of an article in relation to its importance.

RESULTS

Our search identified various activities through which public health can contribute to more effective primary care (Table 1), as well as functions usually performed by primary care that seem to be related to a population health approach (Table 2). Most of these contributions were identified in editorial or opinion papers while only a few were identified through empirical studies.

Contribution of Public Health to Primary Care Provision

Promoting and Protecting Health: Traditional Public Health Roles that Aid Primary Care Activities

Public health activities need to be prioritized and adequately resourced in order to develop long-term sustainable action to improve population health.[20] Access to timely information about regional and community health concerns and needs is required to promote complementary action from both sectors

Table 1

Public Health Contributions that Improve Primary Care Activities

Areas of Activities	Contributions of Public Health to Primary Care Activities
Activities Related to Public Health	
1. Surveillance of population health	Carries out data analysis to understand population health characteristics and needs
	Carries out data analysis to develop interventions and assessment tools
	Carries out data analysis to assess medical practices
2. Health protection and control of disease	Investigates outbreaks and helps with the screening of contacts and provides advice on appropriate prophylactic and curative treatment
3. Health promotion and action on health determinants	Creates partnerships and shares responsibility with primary care to promote health and well-being
	Promotes policies that sustain health and well-being
4. Prevention of diseases, injuries, and social problems	Shares responsibility for prevention of disease, injuries, and social problems with primary care
	Promotes clinical prevention activities within a population-based approach
	Supports screening, immunization, and early detection
5. Drafting of regulations, legislation, and public policies that have an impact on health	Is a moral authority that promotes equity, quality, and access to primary care
	Identifies partners for service delivery (mapping providers)
6. Service planning and assessment of their impact on population health	Promotes the most effective and efficient care practices Assesses primary care practices
Activities Related to Primary Care	
1. Support for preventive clinical practices	Supports prevention practices and chronic disease management in underserved areas
	Shares the responsibility for health education campaigns or immunization drives with primary care
2. Support for screening and early preventive intervention	Plays a role in secondary prevention at the individual level
3. Support for early diagnosis and intervention	Provides knowledge regarding the prevalence of disease Plays a role in the management of disease, where the private sector has little experience
4. Quality of care and medical errors	*No information was found for this area of activity*
5. Case-finding and notification	Investigates outbreaks
6. Awareness-raising and health advocacy	*No information was found for this area of activity*

Table 2

Primary Care Contributions that Reinforce Public Health Activities

Areas of Activities	Contributions of Primary Care to Public Health Activities
Activities Related to Public Health	
1. Surveillance of population health	Is a source of knowledge and data for public health Is able to identify health needs in the community
2. Health protection and disease control	Is responsible for monitoring the incidence of communicable diseases and treating them
3. Promoting health and acting on health determinants	Is responsible for carrying out prevention activities
4. Prevention of diseases, injuries, and social problems	Is responsible for health promotion Develops health promotion at a community level
5. Drafting of regulations, legislation, and public policies that have an impact on health	Primary care, through electronic patient records, could become a source of data to assess coverage and efficiency of health care
Activities Related to Primary Care	
1. Supporting preventive clinical practices	Provision of primary care services leads to a decrease in mortality Primary care improves health promotion and prevention by mobilizing the community Electronic medical records may facilitate preventive practices, if analyzed Public health and primary care share the responsibility for health education campaigns or immunization drives
2. Supporting screening and early preventive intervention	Screening and opportunistic prescription of prophylactic treatments in primary care contexts allows timely intervention and reduced transmission of infectious diseases
3. Supporting early diagnosis and intervention	Aggregation of accurate diagnoses can specify the occurrence of the disease
4. Quality of care and medical errors	*No information was found for this area of activity*
5. Case finding and notification	GPs help identify cases and contribute to public health surveillance
6. Raising awareness and advocating for health	GPs are involved in their community; they engage with the local population GPs can use their expertise to advocate in relation to social inequalities and support patients' interests

in relation to determinants of health. Populations, often with large variations in wealth, education, culture, access to health care, or distance to health services, rely heavily on primary care and public health to achieve equity in health outcomes.[21] The value of primary care accrues from the services provided to individual patients, but also from the improved functioning of health care systems, and perhaps by freeing up resources to be spent on public health and the social determinants of health.[21]

In addition, both sectors could collaborate in the identification of evidence-based health promotion activities. This is already happening to some extent. Interventions for health promotion are routinely performed by clinicians with individual patients such as smoking cessation counseling or general advice for healthy lifestyles.[22,23]

Public health and primary care could share the responsibility for prevention of diseases, injuries and, to a certain extent, social problems. Cooperation between these sectors could emerge in the form of health surveys to document unmet needs, health education campaigns, immunization programs, or screening programs.[12,24] For example, sentinel networks of general practitioners collaborate with public health authorities (e.g., Switzerland's Sentinella project (www.sentinella.ch)), to collect not only epidemiological data on specific diseases, but also to assess population health needs. However, responsibility often falls primarily on the public health sector, especially when the clinical problem (e.g., sexually transmitted diseases, tuberculosis and other health problems associated with economic deprivation) is concentrated in members of population groups shunned by primary care services.[12] Public health also plays a role in secondary prevention at the individual level (e.g., case detection and the contacts of individuals with communicable diseases).[12] The combination of primary care and population health management offers some opportunities for the improvement of the health of marginalized groups.[25] Public health programs also aid preventive clinical practices and chronic disease management in medically underserved areas.[26] One example is the New York City Health Department program that sends trained health department representatives to primary care offices in medically underserved areas. These representatives promote clinical prevention services and chronic disease management targeted by the health department.[26]

Surveillance, Planning, and Assessing the Impact of Services: An Emerging Role for Public Health

Early diagnosis and treatment, which are directly related to primary care, could also be aided by public health protection activities. Public health provides knowledge concerning the prevalence of diseases and plays a

direct role in disease management in the case of outbreaks.[12] Outbreak investigations identify the source of ongoing outbreaks and help to prevent additional transmissions, provide epidemiological training and foster cooperation between the clinical and public health communities.[27] In addition, conditions such as sexually transmitted diseases and a large proportion of substance abuse problems are also targeted by public health activities and reinforce primary care practices.

Primary care practices benefit from public health institutions investing in collecting information that is both relevant for clinical settings and communicated in a timely manner.[18] Surveillance and analysis of the population's health and well-being through the use of aggregate data of registered patients or area-based populations can allow for a better understanding of client characteristics, the identification of community needs, and the development of interventions and assessment tools.[28] Public health methods can contribute to the assessment of the adequacy of primary care received by communities and populations. This is especially true for attributes of primary care such as first contact, continuity, comprehensiveness, coordination, community orientation, cultural sensitivity and family-centeredness.[12]

Finally, public health contributes to primary care by assessing the effects of collective action and services on population health. Public health encourages the most effective and efficient care, and where possible, measures outcomes for complex diseases and populations.[21] The field of public health has methodologies that can be used to evaluate equity of health services administered by community providers[12] and can provide expert advice that may help to integrate and prioritize services.[29]

The Contribution of Primary Care to Public Health

Implementing Health Promotion and Prevention Programs in Clinical Settings

Several authors highlight the need for the promotion of personal health through primary care.[15,16,30,31] Primary care has a strong role to play in the promotion of health and well-being given its frequent interaction with the vast majority of the population at different stages of the progression of various diseases. In fact, primary care is the main point of contact with the health system for the majority of the population. This is bound to increase with new targets for chronic disease management and the expanding health care team.[15] Primary care organizations facilitate and coordinate community projects that are likely to improve the health and well-being of the community.[32] There is also good evidence that in some areas of health promotion primary care interventions are not only very useful but also very cost-effective.[30]

As mentioned previously, prevention of diseases, injuries, and social problems are functions that are split between public health and primary care. One of the responsibilities of general practitioners is to provide prevention and screening services that meet the needs of their communities. Preventive clinical practices are often integrated into primary care. Strong primary care organizations will improve prevention and reduce the population burden of avoidable morbidity and mortality.[11,33] They are also increasingly oriented to vulnerable groups, before disease and psychosocial problems emerge.[32]

A Sentinel Role for Case Identification and Notification

Several authors mentioned that one of the important contributions of primary care to public health is their role in population data collection. Electronic health records from medical practices may be stored in data warehouses, permitting the analysis of change in illness patterns, as well as detection of previously unknown illness clusters. Primary care may thus contribute to the surveillance and analysis of the population's health and health needs by acting as a sentinel system, through the provision of clinical knowledge and epidemiological data.[15,26,28] The benefits of greater interaction between public health and primary care could be an improvement in data quality, data interpretation, needs assessment and commissioning of appropriate services.[15]

Finally, primary care has an important part to play in health advocacy and the development of collaborations among organizations in order to tackle important health problems.[15] Some authors have cited the need for a new type of doctor who commits to health promotion and to addressing determinants of health.[29,34] Practitioners can support patients and their communities by carrying out advocacy work, for example, in relation to housing or income agencies, and by linking patients to community and specialist resources.[35]

Organizational Models that Promote Interactions Between Primary Care and Public Health

As part of this search, we also identified organizational models in highly industrialized countries that may contribute to the interaction of the two sectors (Table 3). However, a systematic search of current health reforms was not part of our review, and the following discussion is intended as an outline of promising activity that could impact on primary care and public health interaction, rather than an exhaustive review.

Integrating Public Health Perspectives in Medical Practice

Effective and efficient organizational models are required to support team-based interventions whereby physicians, nurses, public health practitioners

Table 3

Significant Primary Care Models

Models (Country)	**Definition**	**Functions Related to an Integrated Public Health and Primary Care Approach**
Integrating Primary Care and Public Health in the Provision of Care for Individuals		
Community Health Centers (CHCs) US and Canada	Non-profit organizations (US) and public institutions (Canada) that provide primary health and health promotion programs for individuals, families, and communities	Domestic violence prevention/treatment Parenting education to improve healthy child development Parent-child resources and drop-ins Anti-racist initiatives to promote tolerance, diversity, and acceptance of minorities Counseling related to body image issues, peer relationships, healthy sexuality Programs for teen mothers
Community-Oriented Primary Care (COPC) UK	This model allows a continuous process for developing primary care provision in a community on the basis of its assessed health needs through the planned integration of public health and clinical practice.[59]	Defining and characterizing target communities Prioritizing the problems most detrimental to the health of the community Adapting primary care services to the community in order to improve its health Establishing systematic monitoring, evaluation, and reassessment of the effectiveness of the program
Integrating Primary Care in the Overall Service Provision System		
Health and Social Services Centre (HSSC) Canada	Merger of acute care hospitals, long-term care facilities and local community health centres.[32]	Promote health and well-being Assess the needs of individuals/families Assist and support vulnerable people Provide a range of general health services and social services and specialized services To cover a range of needs, the HSSC creates service agreements with other partners

Accountable Care Organizations (ACOs) US	A provider-led organization whose mission is to manage the full continuum of care and be accountable for the overall costs and quality of care for a defined population.[45]	Specialist/ hospital linkages. Tend to have a relationship not only with strong primary care physicians but also with other specialists and hospitals across the full continuum of care Financial incentives, such as shared savings or even penalties in some models, which motivate providers to work together to deliver the highest quality of care at the lowest cost with the greatest patient satisfaction Performance measurement to evaluate the quality of care and to prevent over and under use
Medicare Local Australia	Local coordination organisation aiming at improving population-based planning, coordination of after-hours care and transitions between hospital care and community-based primary care, as well as increasing the coverage of underserved communities.[60]	Make it easier for patients to access the services they need Work closely with local hospital networks to make sure that primary health care services and hospitals work well together for their patients Plan and support after hours face-to-face practitioner services Identify where communities are missing services and where coordinated services are needed Support primary care providers to adopt and meet quality standards Accountable to communities to make sure that services are effective and of high quality
Integrating Public Health into the Medical Practice		
Family Health Team (FHT) Canada	An approach to primary care that brings together various health care providers, and coordinates high quality of care for patients. FHT consists of doctors, nurses, nurse practitioners and other health professionals who work collaboratively.[36]	Based on teams of health professionals Ensure greater accessibility of services, general support, and monitoring of patients Facilitate access to a family doctor Improve delivery and quality of primary care and services Health care management Health promotion

Multidisciplinary Health Clinics France	Multidisciplinary health clinics provide medical care and participate in activities of prevention, health education, and social action. They are made up of health care professionals.[39]	Based on teams of health professionals Improve delivery and quality of medical primary care and services Health education and health promotion Participate in social action in the community
Patient Centered Medical Home US	A primary care model that delivers the core functions of primary health care.[61]	Accountable for the majority of patient's physical and mental health care needs Provides primary care that is relationship-based, oriented to the whole person Coordinates care across all parts of the broader health care system Delivers accessible services with shorter waiting times for urgent needs Demonstrates a commitment to quality improvement
General Practitioners with a Special Interest UK	A GP with a special interest (GPwSI) supplements their role as a generalist by providing an additional service while still working in the community.[62]	Reduce costs and unnecessary secondary care referrals Improve skills and facilitate effective management of patients in primary care Improve services by reducing delays, improving access, and keeping care closer to home Enhance patient care by managing a condition as a specialist, but also takes a holistic approach to co-existing multi-morbidities

and other health professionals have an identified and manageable role to play in health promotion and heath care management.[6] A team of health professionals would provide a broad range of services in response to the recognition that population health needs are diverse and complex.[36] For example, the recent primary care model instituted in the province of Ontario, Canada, the Family Health Team (FHT), is considered to be among the most promising models in the world.[37] The FHT model is a primary care model that aims to transform the practice so as to implement interdisciplinary teams linked with other services and the public health system. A FHT can provide ongoing health care through a team of family doctors, registered nurses and other health care providers like dietitians and social workers. Teams are formed based on community needs, and they focus on chronic disease management, disease prevention, and health promotion. The FHT model is based on a multidisciplinary team offering a wide range of services, including more hours of access for an enrolled client base.[38]

Another model of primary care is multidisciplinary health clinics (*maisons de santé pluridisciplinaire*), which began to be implemented across France in 2008. These clinics are designed to provide, under the same roof, coordinated care by a group of health professional such as physicians, nurses, physiotherapists, and nutritionists, to a specified population.[39] These models are established on a voluntary basis, and are constituted by a team of professionals under contract with the government. In order to be accredited as a multidisciplinary clinic, they must have a minimum of two family physicians and three other professionals. A distinctive characteristic of this primary care model is that they must have a "health project" based on prevention activities and health education as well as social actions.

In terms of the potential benefits associated with these two models, FHTs and multidisciplinary health clinics, it was found that they facilitated the development of physician–nurse collaboration in medical practices and strengthened links with other professionals in the broader care network. With the implementation of these models, the health care system hopes to better respond to the growing demand for health services and the requirements for teamwork.

Another example of collaboration between public health and primary care can be illustrated by the patient-centered medical home (PCMH) emerging in the United States health care system. In this model, the management and coordination of care for patients with chronic diseases is led by family physicians, other PCMH members, and the communities in which the patients reside. If properly organized and supported within the health care system, the inter-professional PCMH teams could help prevent

many health complications associated with chronic diseases or mitigate their impacts. Moreover, an effective public health intervention system should be closely linked to community-based family physicians and to PCMHs, recognizing them as essential to the achievement of the broader population and public health goals.

The "patient-centered" part of the medical home depends on having active, engaged patients who want better services and transparency in health care and seek to form partnerships with health care practices. Patients ask for the care they want and need, when and in what form they want it, as well as for access to information to make appropriate choices.[40] The PCMH model incorporates new health information technologies, electronic clinical information systems, and telecommunications capabilities. When coupled with primary care payment reform, the medical home offers great promise for improved health outcomes and better integration of care and prevention.[40]

Finally, another primary care model consists of general practitioners (GPs) with a special interest in public health. The GPs work with a public health perspective and take on a public health function in order to bridge the traditional gap between public health and primary care. They seek to help primary care to look beyond the walls of the practice, to take into consideration the local population, and to tackle health inequalities and health improvement in an innovative and evidence-based way. It could allow the philosophies and functions of the two sectors to be combined and foster the development of a workforce capable of bridging the gap between public health and primary care practice.[15]

Public Health and Primary Care Interaction in the Provision of Community-Based Care

Community health centers (CHCs), implemented in Canada and the US, are another important model of primary care provision that integrates a public health perspective. CHCs are designed to meet community needs as well as those of specific population groups. CHCs provide health promotion activities which aim to address health determinants. Beyond this, they also provide clinical care from doctors, nurse practitioners, nurses, dieticians, social workers, and other health professionals, all under one roof.

CHCs implemented in Canada and the US have several distinctive characteristics. In the US the CHC is the main model receiving federal grants for primary care. The US safety net consists of health care professionals who are willing to provide services to the nation's uninsured and underserved population. Integration of health care services is a major focus. Administrative and health care personnel meet regularly in order to address

the health care needs of a specific location. Multiple services are provided that vary depending upon the site including primary care, dental care, counseling services, women's health, health promotion and education, podiatry, physiotherapy, case management, advocacy, and intervention. The mission of CHCs depends on collaborative relationships with industry, government, hospitals and other health services.

CHCs in the province of Québec, Canada, were one of the first models of primary health care. Starting in the early 1970s, the government launched an ambitious reform project by creating community service centers for the entire population. These primary care organizations were entirely public, not only in terms of funding, infrastructure and resources, but also for governance. The CHC model was particularly innovative with regards to governance because it was under the responsibility of the Ministry of Health and Social Services, and also because it incorporated the social service component in the provision of health care services. A variety of professionals work in the Québec CHCs: physicians, nurses, occupational therapists, physiotherapists, nutritionists, psychologists and social workers. They provide both preventive and curative services, as well as services such as home care.[41]

Similarly to the CHCs, community-oriented primary care (COPC) is a primary care-led health care delivery strategy found in some countries such as the United Kingdom. It incorporates epidemiology, public health, and financial management, and its goal is to maximize health for a given target community.[42] A COPC often develops a better understanding of the health needs in the community as a step to improving its health.[43,44] COPC is a major source of knowledge for health authorities and provides an opportunity to increase managers' understanding of primary care. COPC also reinforces public health through the development of skills in collecting and analyzing health data, integrating evaluation processes, and the development of teamwork and interprofessional collaboration.[43,44]

Public Health and Primary Care Interaction as part of a Broad Health System

In Québec, the Health and Social Services Centers (HSSC) have become the basic building blocks for the local service network, and are responsible for ensuring accessibility, continuity, and quality of services for the population of the province of Québec. HSSCs were created by merging the territorially-based community health centers, with long-term care institutions, and generally, an acute care hospital.[32] The activities developed by the HSSCs reflect a population-based perspective for the delivery of health care services. The HSSCs facilitate and coordinate community projects that are

likely to improve the health and well-being of their populations.[32] In terms of health promotion, the HSSC managers try to reinforce the work of professionals carrying out preventive interventions. As part of this reform, managers increasingly act to reach potentially vulnerable clientele before disease and psychosocial problems emerge. Assigning population-based responsibilities to a HSSC leads to better interaction between public health and primary care.[32] Each HSSC was formally mandated to lead the creation of a local health network by encouraging the establishment of formal or informal arrangements among various providers within its territory that offer care services. These local health networks were largely created through virtual integration in the form of alliances and partnerships among autonomous organizations, often with different mandates (hospital, community clinic).

The accountable care organizations (ACOs) are one of the most recent widely discussed models for system reform in the US.[45] The Patient Protection and Affordable Care Act called for the creation of ACOs as a way to encourage physicians, hospitals, and other health care providers to work across settings, so as to coordinate and improve care for a defined population of patients and to benefit from any cost savings they might achieve.[46] An ACO is an entity made up of health care providers who take responsibility for the health needs of a defined population of patients, with the goal of improving care coordination, quality, and the patient experience, while reducing per capita costs.[46] The core of an ACO is effective primary care.

In addition to the core function of primary care practice, ACOs promote shared accountability by offering financial incentives, such as shared savings or even penalties, to motivate providers to work together to deliver the highest quality of care at the lowest cost, while maintaining or increasing patient satisfaction. The shared savings mechanism of ACOs may provide strong incentives for the coordination of medical and behavioral health care.[47] Thus, performance measurement is a cornerstone of the model, and includes the evaluation of the quality of care to prevent potential overuse and underuse.[45] Also, ACOs tend to have a relationship with a strong base of primary care physicians, but also with other specialists and hospitals across the full continuum of care. That may also expand to include public health and community services.[48]

Another recent model, which aims to integrate primary care into the overall health system, is the Medicare Local model. This model has recently been proposed in the Australian context. The key feature of Medicare Local is an overarching regional governance framework for primary health care via better interaction and coordination of services within primary care, and better linking of primary care with other sectors.[49] A recent study suggests

that Medicare Locals work closely with newly formed hospital networks to identify and address regional population needs and to improve patient care and the quality and safety of health services.[49]

DISCUSSION

Our literature review shows a growing concern in relation to how public health and primary care could interact in order to create synergy from their activities. Such interaction could bring these two groups of health care professionals into a single system. Primary care and public health practitioners could be part of collaborative teams with common objectives, share information systems, and participate in the planning of services for the same patients and populations.[4]

Our literature synthesis noted numerous proposals and existing forms of interaction between primary care and public health. One of the clear overlap between the two fields is disease and illness prevention. Most authors identified screening and immunization as action that may be carried out in primary care, but that can benefit from the support of public health departments. In addition, health promotion and behavior modification were also seen by most authors as a shared responsibility at the interface of collective and individual intervention. Another aspect that was the subject of analysis in many documents concerned the surveillance and protection functions of public health from a case identification and prevention or early treatment perspective. Primary care was seen as the "ear on the ground," the service to which people would present, while public health had the role of investigation and provided advice back to clinical settings.

Our literature search also identified emerging forms of collaboration between primary care and public health. Although it was not mentioned as frequently in the papers, planning and evaluation was an emergent theme in most recent documents. For example, Nourevitch et al.[50] conducted an empirical mapping of patients' health care patterns in urban areas. This analysis identified a constellation of providers that could serve as a naturally occurring accountable care organization for a significant portion of people who live or work in a specific neighborhood characterized by poor health outcomes.[50] Many authors noted that public health competencies and tools are crucial for planning of primary care that is more aligned with the actual needs of the population, and that it could help to prioritize activities according to epidemiological, organizational, and economic trends. This applied also to the evaluation of primary care services with regards to changing population health and analysis of needs of groups of patients.

Figure 1 illustrates the positioning of various functions, highlighting mutual contributions that are part of the core business for both public health and primary care sectors as well as functions that seems to be at the interface of both domains. Preventive medicine is a good example of a function that is strongly rooted at the interface of public health and primary care. For example, a number of recommendations and guidelines, such as those of the US Preventive Services Task Force, were developed and are routinely used by clinicians.[51]

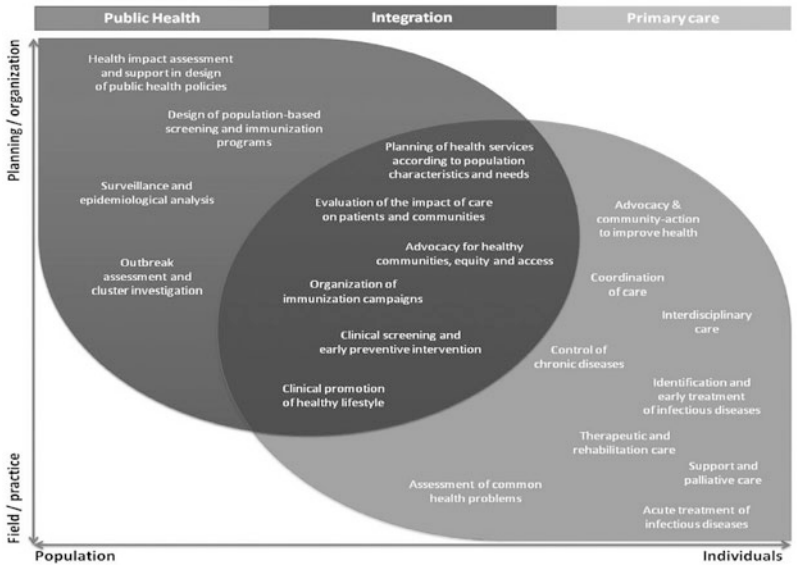

Fig. 1. Public Health and Primary Care Interaction

Our identification of organizational models that use a variety of modalities to facilitate interaction between primary care and public health suggests that health authorities are currently trying to implement new models and imbed this interaction more widely in health care systems. Furthermore, several other factors may also have a positive impact on the interaction between primary care and public health. For example, a general trend was observed for more interdisciplinary approaches that might improve integration of public health and primary care. Some structural changes such as the Quality and Outcomes Framework (QOF) in the UK also provide a potentially advantageous economic incentive (payment for performance) for more effective collaboration between both fields. We also

observed that several models involve the community in the integration of primary care and public health, which could also be a factor that may impact positively on the interaction. However, the extent to which these models represent a true lever for increased cooperation as well as the more specific effects that might be associated with different models, remain to be explored. Will public health's previous hesitation to collaborate with primary care remain for fear of losing resources to the curative care sector at the expense of health promotion activities? Will previous misunderstanding of the benefits of public health competencies for planning and targeting of primary care services continue to prevent clinicians from fully engaging in activities that aim to reinforce individual care or provide feedback on efficacy and effectiveness of primary care? Will the different funding and organizational structures encourage the clinical manager in primary care to partner more extensively with public health?

All these models have some limitations, which were occasionally mentioned by the authors of the papers that were reviewed. For example, the COPC model suffers from a lack of solid and sustainable financing beyond experimental implementation phases. The wide variability of the level of involvement of the different communities in the COPC programs is also a limiting factor for this model.[3,52,53]

The primary consideration that prevents the generalization of most of these models to other settings is the context in which they were implemented or tested. Indeed, the health system, political commitments, economic situation, or social context can potentially have a major effect on the vision of primary care and public health interaction. A recent paper by Marks et al. explained that the economic context was more important for decision making than the deployment of specific public health tools.[54] In Greece, it is anticipated that the economic crisis is likely to reshape the health care system, notably through decentralization and a strengthening of the public health and primary care partnership.[55] Others in the US have noted that in the future, because of political orientations, primary care will be linked more strongly to the community, while public health will avoid health care delivery.[56,57] The health care system itself (e.g., organization, mode of financing) is also likely to strongly affect the interaction between primary care and public health. For example, a study published in 2002 identified important differences in health services covered by health insurance plans in six European countries, including prevention activities.[58] Despite the importance of the influence of these "external factors" on the interaction of primary care and public health, they are rarely mentioned in the papers reviewed here. These factors should be considered when implementing new models of care that seek to create strong primary care/public health partnerships.

Strengths and Limitations

Our literature synthesis benefits from several strengths. First, it generated results that concord with previous reports and special supplements that propose that public health and primary care should extend their collaboration and suggestions concerning ways in which this could be achieved. Second, our review is based on an independent assessment of each paper by various researchers. Finally, our literature search is based on a systematic analysis of content according to a concept-based grid.

However, this scoping review also suffers from some limitations. The discussion in most papers remained general and few gave empirical examples from real clinical and public health department settings. We have tried to mitigate this somewhat by providing examples of forms of collaboration in the US, Canada, France, Australia and the UK. In addition, we have not retrieved all possible models which favor interaction. The search of the gray literature aimed to identify a sample of different types of integrative organizations, rather than to carry out a full scoping review of existing models.

CONCLUSION

Our aim was to review the current literature related to how primary care and public health interact by identifying their respective contributions and highlighting some organizational models that could facilitate such an interaction. Our analysis of the scientific and gray literature identified various ways by which public health and primary care either reinforce each other through their respective functions or increasingly act in a common space to increase population health and health systems performance. Our search identified several papers which suggest that traditional public health functions and primary care roles are the main ways by which these sectors interact. In addition, our search identified emerging roles related to the planning and evaluation of services, and the enactment of public health roles in primary care settings and organizational models that go beyond traditional collaboration in prevention services and control of infectious diseases.

Our search found several recent reports and supplementary journal issues on this topic[2,3] clearly indicating its current relevance. However, our search did not retrieve many empirical studies related to the interaction of public health and primary care. Most papers were editorials or descriptions of organizational models that aim to enhance this interaction. Future research should include empirical methods and the development of indicators that would help with the assessment of the interplay between public health and

primary care. Finally, we found significant similarities, across countries and contexts, in the approaches used to enhance the collaboration between public health and primary care. However, some activities seemed to be associated with certain contexts. One of the challenges to identifying effective approaches to enhancing the interaction of public health and primary care lies in a better understanding of the different contexts in which the two domains have worked together successfully. In addition to this, another challenge will be to implement, across different health systems, elements found in one context that allow effective collaborations, and to assess these efforts.

Appendix 1

Definitions Activities Related to Public Health and Primary Care[3,4,7,8,63,64]

Areas of Activities	Definitions
Activities Related to Public Health	
1. Surveillance of population health	Includes the development and quality assurance of information systems, production and dissemination of information for the public, stakeholders and decision makers.
2. Health protection and control of disease	Corresponds to the implementation of interventions for individuals or a group of individuals in relation to a real or perceived risk. It results in an investigation and analysis of cases, outbreaks or epidemics, and production of public health advice.
3. Health promotion and actions in relation to health determinants	Refers to interventions carried out in order to prevent an event or a particular health condition. Prevention of diseases, injuries, and social problems; a focus on the characterization of risk factors; the identification of effective methods for the development and implementation of community prevention programs.
4. Prevention of diseases, injuries and social problems	A set of actions that enable individuals and communities to exercise greater control over their health; focus on the development of healthy behavior and community action as well as the creation of environments and social policies favorable to health.
5. Drafting of regulations, legislation, and public policies that have an impact on health	Concerns the adaptation of services to goals of the health system in terms of the impact on population health, quality, and equity in access to care. This role can result in activities that promote effective practices, the implementation of systematic screening, and public health advice to clinicians and administrators in order to influence their practice. It also includes dissemination and promotion of organizational models most favorable to health care and equitable access.
6. Planning of services and assessing their impact on population health	Focuses on the impact of changes in the organization of care, the analysis of social inequalities in terms of access to curative care and services, evaluation of different models of the organization of curative and preventive care as well as the impact of public health interventions.

Activities Related to Primary Care	
1. Supporting preventive clinical practices	Preventive clinical practices are a set of interventions (counseling, screening, immunization, prophylaxis) performed by a health care professional. These interventions aim to promote health and prevent diseases, injuries, and psychosocial problems. Preventive clinical practices should prevent the occurrence of disease.
2. Supporting screening and early prevention intervention	Screening activity is used to find disease or abnormalities among populations at risk of developing a disease. These investigations may be followed by medical consultations, clinical examinations, and treatments. Prophylaxis is the active or passive process aimed to prevent the emergence or spread of disease.
3. Early diagnosis and intervention	Early diagnosis is used to identify a disease based on the patient's symptoms and doctor's examinations. Medical treatment is a remedial process to cure a health problem.
4. Providing care that is of good quality and safe	Quality of care is a broad term encompassing various desirable attributes of care with regards to its technical and interpersonal appropriateness and safety. Quaternary prevention is the prevention of unnecessary medical activity and careful use of medication.
5. Case finding and notification	Involves the identification of cases within routine health care delivery, e.g., during a visit at the doctor's office for some related or unrelated symptom. It may include special clinical or technical procedures in addition to a routine medical of a patient. Case finding does not include a systematic screening of the target population.
6. Raising awareness and advocating for health	Advocacy seeks to increase the power of people and groups and to make institutions more responsive to human needs. It attempts to enlarge the range of choices that people may have by increasing their power to define problems and solutions and to participate in the broader social and policy arena

Acronyms List:

ACO = accountable care organizations
HSSC = Health and Social Services Centre
CHCs = community health centers
COPC = community-oriented primary care
FHT = Family Health Team
GP = general practitioner
PCMH = patient-centered medical home

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