

Multidisciplinary Collaboration for Enhanced Public Health Response: Insights from Pharmacy, Epidemiology, Emergency Care, and Social Services

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ABSTRACT

As public health challenges grow in complexity, multidisciplinary collaboration has proven essential for effective responses to health crises such as pandemics, natural disasters, and the rise of chronic diseases. This review highlights the distinct roles of pharmacy, epidemiology, emergency care, and social services in strengthening public health initiatives. Pharmacies have become central in preventive care by offering accessible health services, including medication management, vaccinations, and health screenings, which are particularly valuable in underserved areas. By expanding their reach, pharmacies help support early detection and continuous care, playing a crucial role in community health. Epidemiologists provide the data needed to track disease trends, understand outbreak patterns, and identify high-risk populations. Their work allows for precise targeting of interventions and resource allocation, making it possible to respond to emerging threats with data-driven strategies. Emergency care providers are integral to frontline health responses, delivering rapid assessment, stabilization, and triage under high-pressure conditions, which is essential during large-scale health events. Their role in handling acute cases is indispensable in managing the immediate demands of health crises. Social services contribute to public health efforts by addressing the socioeconomic determinants of health, such as housing, food security, and mental health support. These services are essential for promoting adherence to health measures and enhancing the resilience of communities, particularly for vulnerable populations. During the COVID-19 pandemic, this multidisciplinary collaboration demonstrated its value by uniting diverse expertise and resources to improve health outcomes and reduce strain on healthcare systems. Together, pharmacy, epidemiology, emergency care, and social services form a comprehensive, synergistic network capable of meeting complex public health needs and fostering long-term community resilience.

KEYWORDS: health, epidemiologists.

Introduction

In the face of increasingly complex public health challenges—ranging from pandemics and natural disasters to rising rates of chronic disease—multidisciplinary collaboration has emerged as a critical factor in improving public health responses. Public health crises are rarely confined to one field; they require a coordinated effort across multiple sectors to address the diverse and intersecting needs of affected populations. Pharmacy, epidemiology, emergency care, and social services each contribute unique expertise, resources, and perspectives to public health efforts, allowing for a more comprehensive approach to both prevention and crisis response. Pharmacies, for instance, play a vital role in enhancing public access to medications and vaccinations, which is crucial during outbreaks of infectious diseases (Burson, et al., 2016). Epidemiologists provide critical data for tracking and predicting disease patterns, allowing healthcare systems to allocate resources effectively and target interventions (Chen et al., 2020). Emergency care departments manage acute cases and act as first responders in health crises, while social services support community needs by addressing the socioeconomic factors that impact health, such as housing, food security, and mental health services (WHO, 2018). Together, these fields form a foundational network capable of addressing immediate health needs and supporting long-term resilience. However, effective collaboration across these disciplines is challenging to achieve. Communication barriers, limited resources, and differing institutional structures can hinder coordinated efforts, potentially compromising the quality and reach of public health interventions. The COVID-19 pandemic has underscored both the need for and the challenges of multidisciplinary collaboration, revealing weaknesses in health systems worldwide but also demonstrating the benefits of unified public health strategies. In regions where collaboration was strong, communities saw improved access to care, better health outcomes, and reduced strain on individual health sectors, underscoring the critical need for effective multi-professional teamwork in healthcare (Filip et al., 2022). The pandemic's demands led healthcare professionals to adapt rapidly, taking on new roles, adopting novel technologies, and experiencing significant personal and psychological pressures. This upheaval provides valuable insights into team dynamics, informing efforts to enhance team performance across varied clinical environments. Both the NHS People Plan (NHS, 2020) and Health Education England's Future Doctor report envision transformed multi-professional teams that foster respect and empowerment, promoting high-quality, patient-centered care.

Since the 1960s, teamwork has been recognized as an essential approach in healthcare, improving care quality through interdisciplinary collaboration. Healthcare teams are categorized based on their level of responsibility and interaction into interdisciplinary, multidisciplinary, and transdisciplinary teams. Each type involves varying degrees of role overlap and communication. In multidisciplinary teams, professionals work within their specialties independently. In interdisciplinary teams, professionals collaborate more closely, sharing insights to achieve joint patient care goals. Transdisciplinary teams go further, with more role sharing and one member possibly leading the team's overall coordination

(Nancarrow et al., 2013). Research shows that interdisciplinary care is linked to higher patient safety, reduced hospitalization and complication rates, and fewer medical errors. It also enhances care coordination and patient access. A study by Bendowska and Baum (2023) surveyed 1,266 Polish medical, midwifery, nursing, and physiotherapy students on their views of interdisciplinary teamwork. Findings indicated that students believe interdisciplinary care improves healthcare quality, boosts patient safety, and enhances team communication. They also support the integration of interprofessional education in training programs to better prepare future healthcare professionals.

Preventable harm in healthcare, particularly from adverse drug events (ADEs), is a critical and escalating public health concern that also drives up healthcare costs. Research has shown that involving a multidisciplinary care team, including pharmacists, is effective in reducing ADEs. A recent systematic review analyzed randomized controlled trials that involved pharmacists working with at least two other health professionals over the past five years. Occasionally, teams included other specialists like physical therapists, social workers, and community health educators. Where the findings suggested that multidisciplinary medication review meetings—structured around four stages of data collection, appraisal, collaborative review, and follow-up—are a key approach in ensuring safe, effective care in complex cases (Zaij et al., 2023). In healthcare, teams are often created to address complex medical issues by developing innovative solutions. Effective team actions are believed to be more successful in handling these challenges. Specifically, interdisciplinary teams have been linked to reduced medical errors, fewer complications, and increased access to care. Research indicates that ADEs are caused by multiple factors, often related to patient characteristics, existing conditions, medication regimens, or systemic issues (Garin et al., 2021). Key risk factors include polypharmacy and poor adherence to medication. The World Health Organization's Global Patient Safety Action Plan (2021–2030) emphasizes fostering a culture of safety to minimize avoidable harm, advocating for multidisciplinary and interprofessional collaboration to enhance patient safety (WHO, 2021). Improving healthcare systems requires a multifaceted approach targeting four primary goals: elevating care quality, enhancing public health, lowering costs, and improving healthcare professionals' job satisfaction. Research consistently suggests that interdisciplinary teamwork is a key factor in achieving these objectives. According to a WHO report, interdisciplinary teams have shown superior outcomes in family medicine, infectious disease management, and humanitarian efforts. They are particularly effective in epidemic control and managing non-communicable diseases. Health facilities utilizing collaborative teams report reduced medical complications, lower mortality rates, and shorter hospital stays (WHO, 2010). Specifically, interdisciplinary teams contributed to decreased complication rates in internal medicine (Pannick et al., 2015). Interdisciplinary teams are highly recommended for managing pediatric care (Katkin et al., 2017), and for preventing pressure ulcers (Clarkson et al., 2019). The Organisation for Economic Co-operation and Development (OECD) emphasizes that setting clear collaborative goals, identifying innovative solutions, and tackling complex problems will become essential skills for healthcare teams in the future. Additionally, education should prepare students not only for their specific healthcare roles but also to be active, responsible, and engaged

citizens equipped with collaborative skills (Howells, 2018).

This literature review examines recent research and case studies to explore how multidisciplinary collaboration enhances public health responses. It focuses on the roles and contributions of pharmacy, epidemiology, emergency care, and social services, identifying both the successes of collaborative efforts and the barriers that persist. By examining these dynamics, the review seeks to provide actionable recommendations for strengthening partnerships across these sectors, ultimately aiming to improve public health preparedness and resilience in the face of future crises.

1- The Role of Pharmacy in Public Health Responses

Pharmacies have evolved to play a pivotal role in public health. As accessible healthcare providers, pharmacies are uniquely positioned to offer health services, medication management, and preventive care to the public. Their role has expanded significantly in recent years, especially with increased vaccination responsibilities and chronic disease management. Once the COVID-19 pandemic was declared, the International Pharmaceutical Federation (FIP) released interim guidelines titled “Coronavirus 2019-nCoV outbreak: Information and interim guidelines for pharmacists and the pharmacy workforce.” These guidelines aimed to enhance understanding of the role of community pharmacists in managing COVID-19 outbreaks, using Macau’s experience as a reference (Ung, 2020). In Macau, early COVID-19 cases were all from Wuhan residents who developed symptoms locally, raising the risk of community transmission due to high travel volumes. This situation underscored the importance of active surveillance by pharmacists in identifying and referring suspected cases to prevent wider spread. Community pharmacies, often the first point of contact for symptomatic patients, play a critical role in early detection. Pharmacists were advised to familiarize themselves with the CDC’s criteria for patient evaluation, included in the FIP guidelines, to effectively screen patients for referral. As health emergencies evolve, pharmacists must stay engaged, adaptable, and integrated into public health efforts (WHO, 2020). To optimize their contribution in emergency preparedness and response at the community level, effective public-private partnerships and the use of real-world data are essential, ensuring that pharmacists can respond effectively to ongoing and future health crises (Chen et al., 2020).

Pharmacists play a crucial role in public health and emergency preparedness and response (EP&R), participating in screening, vaccinations, testing, and ensuring medication safety during emergencies like pandemics and natural disasters. Their role has been especially vital in responding to COVID-19, as they collaborate within interprofessional teams such as the Medical Reserve Corps. To strengthen their contribution, the Pharmacy Emergency Preparedness and Response (PEPR) Framework has been proposed, building on the American Society of Health-System Pharmacists’ guidance and lessons from past health crises like H1N1 and COVID-19. This framework emphasizes five focus areas: EP&R operations management, patient and population health interventions, public health pharmacy education, continuing professional education, and evaluation and dissemination of outcomes (Aruru et al., 2021). Pharmacists’ frontline efforts are challenged by limited PPE, exposure risks,

and legislative restrictions. Expanding targeted training, integrating into public health teams, and addressing policy barriers could further enhance pharmacists' contributions to EP&R, solidifying their role in future health crises. The COVID-19 pandemic, declared by WHO in March 2020, exposed significant gaps in emergency preparedness, especially in healthcare systems. Challenges like inadequate PPE, testing supplies, and hospital capacity placed strain on frontline workers, including pharmacists. Pharmacy professionals have been actively involved in crisis response, guided by advisories from pharmacy organizations worldwide. In the U.S., joint statements and petitions by pharmacy groups called for enhanced roles and reimbursement for pharmacists, although recent legislation, like the CARES Act, did not grant them provider status. Globally, countries such as the UK and Canada have broadened pharmacists' roles, enabling prescription authority for specific conditions, which may reduce healthcare costs and ease demands on general practitioners (Cadogan et al., 2021). A special collection of articles highlights pharmacists' public health impact and international contributions, emphasizing the vital role of community pharmacists in providing accessible, evidence-based drug information and adapting to varying health models and beliefs worldwide (Brown, 2021; Zheng et al., 2021; Sheppard, and Thomas, 2020; Ung, 2020).

A study on multidisciplinary collaboration in primary care identified four team types: specialized, highly multidisciplinary, doctor–nurse–pharmacist triads, and physician–nurse–centered teams. Collaborative methods included co-location, non-hierarchical interaction, shared consultations, and referral systems. Non-hierarchical collaboration was common in multidisciplinary teams, while co-located collaboration was frequent in specialist teams. Collaboration positively impacted clinical outcomes in 52% of cases (Saint-Pierre et al., 2018). The Community Health Enhancement Initiative (CHEI) is a pioneering model designed to improve public health in the U.S. through collaboration among healthcare entities (Smith et al., 2023). This initiative emphasizes the importance of uniting diverse healthcare providers to enhance population health by addressing immediate community needs and promoting health literacy, disease prevention, and wellness (Adams et al., 2023). CHEI's approach is strategic, involving communities directly in their health management through educational workshops and accessible services, demonstrating that cooperative models yield stronger health outcomes. Research shows that collaboration improves healthcare delivery and enables positive health outcomes by combining resources, expertise, and shared goals (Adams et al., 2023). This initiative integrates a range of partners—including primary care providers like Kaiser Permanente, Geisinger Health System, and Providence Medical Group—who are critical in providing accessible, community-focused healthcare (Walker et al., 2023). By leveraging a synergistic network, CHEI not only addresses public health challenges but also supports a cost-effective, comprehensive approach to health management, advancing national efforts to transform community health services at a foundational level (Smith et al., 2023).

In collaborative healthcare initiatives, each partner brings a unique value, essential for enhancing patient outcomes. Healthcare providers—physicians, nurses, and allied professionals—are pivotal, delivering patient-centered care through evidence-based practices and clinical expertise to drive positive health outcomes. Community

organizations extend the initiative's reach by addressing social determinants of health and promoting health education, effectively engaging diverse populations and supporting preventive care (Adler & Stewart, 2021). Technology partners, including IT and data analytics firms, provide critical tools for seamless data exchange, interoperability, and actionable insights, enhancing care coordination and decision-making (Ajegbile et al., 2024). Interdisciplinary teams act as the core of this collaboration, integrating expertise from various fields—such as medicine, social work, and technology—to ensure comprehensive, holistic patient care (Bendowska et al., 2023). Together, these partnerships foster a synergistic approach, creating a healthcare model that is adaptable, inclusive, and effective in meeting diverse community needs. They ensure the availability of essential medications, protective gear, and remote pharmacy services, especially for vulnerable and chronically ill patients (Bragazzi et al., 2020). This integrated, patient-centered approach advances both infection control and overall healthcare quality, transforming pharmaceutical services from a product-based to a services-oriented focus.

Each year, about 50,000 adults in the U.S. die from vaccine-preventable diseases (Burson et al., 2016). Despite ongoing public health initiatives, vaccination rates for adults remain below recommended levels due to barriers like limited access to regular healthcare and missed opportunities for preventive care. One solution is to expand vaccination efforts through non-traditional sites, particularly community pharmacies. With around 56,000 pharmacies across the U.S., they offer a valuable opportunity to boost vaccination rates. By 2015, over 280,000 pharmacists were trained to administer vaccines, a move supported by organizations like the American College of Physicians for its potential to reach more adults and high-risk groups (Rothholz, 2013). Community pharmacies have long been a cornerstone of healthcare delivery, especially for underserved populations. They offer a direct point of access for health services such as vaccinations, health screenings, and medication management. According to recent studies, community pharmacies improved vaccine accessibility during the COVID-19 pandemic, administering millions of doses worldwide and reducing the burden on traditional healthcare facilities. This success has sparked discussions about expanding the role of pharmacies in other preventive health services, including regular health screenings for diabetes, hypertension, and cardiovascular risk factors.

A multidisciplinary approach to infection management is crucial, combining symptomatic treatment, patient counseling, and vigilant monitoring tailored to each patient's needs. Follow-ups are essential to detect clinical deterioration, manage comorbidities, and provide specialized care, particularly for high-risk groups like infants, pregnant women, and the elderly. Effective care requires collaboration among specialists in fields such as critical care, infectious diseases, cardiology, and microbiology (Razonable et al., 2019). Additionally, support from occupational therapists, dietitians, pharmacists, and psychologists strengthens comprehensive care. Pharmacists play a critical role in this team, managing drug supplies, educating patients, and dispelling COVID-related misinformation (Hahn, 2020). Pharmacists adopted three core principles—trust, meeting people where they are, and building community capacity—to create "safe spaces" for vaccinations. They employed nine strategies to put these principles into action: fostering community partnerships,

addressing transportation and language barriers, offering patient education, ensuring culturally sensitive care, and advocating for policy reform. These approaches demonstrate how community pharmacies promote equitable vaccination efforts and highlight their critical role in advancing public health and health equity (Carroll et al., 2024). A study evaluating their contributions found that between February 2020 and September 2022, pharmacists conducted over 42 million COVID-19 tests, administered more than 270 million vaccinations (including 8.1 million for long-term care residents), and provided over 50 million flu and other vaccines annually. Pharmacists likely accounted for over 50% of all U.S. COVID-19 vaccinations. Their efforts were estimated to have prevented more than 1 million deaths, 8 million hospitalizations, and delivering over 350 million interventions to more than 150 million people (Grabenstein, 2022). A 2021 systematic review and meta-analysis by Ruiz-Ramos et al (2021) supported this approach, demonstrating that pharmacist participation in a multidisciplinary team improves patient safety by reducing readmission rates, enhancing quality of life, and offering cost benefits.

Pharmacovigilance—monitoring the safety of medications—is essential during health crises, especially when rapid deployment of treatments is necessary. Pharmacists are trained to detect, report, and manage adverse drug reactions, ensuring patient safety even during emergencies. For instance, during the Ebola outbreak, pharmacists played a key role in monitoring side effects and managing medication adherence in West African countries (WHO, 2015). This vigilance is crucial as new treatments and vaccines are introduced during public health emergencies, where long-term safety data may be limited. Medication management, particularly for chronic conditions, is another critical area. During emergencies, patients may face disruptions in medication supply chains or limited access to healthcare facilities. Pharmacists can provide alternative solutions, assist with emergency refills, and educate patients on managing their conditions independently. Research has shown that pharmacist-led interventions during crises can improve patient adherence to medications and reduce hospital admissions, especially in vulnerable populations with chronic diseases (Marcum et al., 2021). Physician-pharmacist collaboration significantly improves care and clinical outcomes for patients, especially as interdisciplinary approaches become crucial for modern medical problem-solving. For example, geriatrics, like many medical specialties, requires comprehensive knowledge of pharmacokinetics, drug interactions, dosing, and side effects. The COVID-19 pandemic has further underscored the importance of interdisciplinary care, as healthcare systems worldwide face severe strain. Polypharmacy, common among older adults, complicates treatment and increases risks, particularly for COVID-19 patients. Collaborative models between physicians and pharmacists—practiced in countries like Canada, the Netherlands, and the UK—enhance medication safety and manage drug interactions, reducing severe COVID-19 outcomes in this vulnerable group (Seostianin et al., 2020). Pharmacies also play a logistical role in managing and distributing essential medicines during emergencies. Stockpiling, supply chain coordination, and rapid distribution of medications are essential components of a coordinated response. For instance, during natural disasters such as hurricanes, pharmacies partner with emergency management agencies to ensure the availability of critical medications like insulin, antibiotics, and pain relievers (Sharpe & Clennon, 2020). Challenges in this area

include managing cold-chain logistics, coordinating with supply chains, and addressing disparities in medication access. Collaboration between pharmacies and public health agencies is key to overcoming these obstacles, as shown in the successful responses to Hurricanes Harvey and Irma in the U.S., where pharmacies collaborated with the Federal Emergency Management Agency (FEMA) and local health departments to mobilize resources (McGugan, 2017; Nitzki-George et al., 2018).

2- Epidemiology's Contribution to Public Health Emergencies

Epidemiology is the backbone of public health, providing data-driven insights that inform interventions, track disease progression, and predict future outbreaks. Epidemiologists play a crucial role in monitoring health trends, guiding policy decisions, and communicating risks to the public and stakeholders. Disease surveillance is fundamental to managing public health emergencies. Epidemiologists collect and analyze data on disease incidence, prevalence, and distribution, enabling health authorities to respond to emerging threats. Surveillance networks, like the Global Influenza Surveillance and Response System (GISRS), provide timely data on influenza trends, enabling countries to prepare for seasonal outbreaks (Hay & McCauley, 2018). During the COVID-19 pandemic, global collaborations such as the World Health Organization's COVID-19 dashboard and national reporting systems provided near-real-time data, which was crucial for decision-making and resource allocation. Surveillance systems rely on data from multiple sources, including hospitals, pharmacies, laboratories, and community health centers. Effective collaboration between these entities is essential for accurate data capture and timely reporting. Studies on infectious disease outbreaks, such as the H1N1 influenza in 2009, show that multidisciplinary data sharing can significantly reduce response times, improving public health outcomes (Pappaioanou & Gramer et, 2010).

3.2 Modeling and Forecasting

Epidemiological modeling is essential for predicting disease spread and planning interventions. Models consider various factors, such as population density, mobility patterns, and social behavior, to estimate infection rates and guide preventive measures. For instance, predictive modeling during the COVID-19 pandemic was instrumental in understanding potential outbreak trajectories, informing lockdown decisions, and estimating healthcare needs (Dasgupta & Wheeler, 2020). The integration of data from social services, pharmacies, and emergency care strengthens model accuracy, offering a more comprehensive view of public health dynamics. Collaborative models that incorporate socioeconomic data and healthcare utilization patterns have proven effective in guiding resource distribution and identifying high-risk populations (Brewster et al., 2018). Emerging and re-emerging infectious diseases have long posed significant challenges, prompting the use of modeling for over a century to understand and manage outbreaks. Modeling helps predict epidemic dynamics, guiding public health interventions and shaping strategies for optimal responses. This approach has informed essential areas, including health system organization, supply planning, and determining the timing of interventions (Martin et al., 2022). During COVID-19, predictive models were pivotal, forecasting scenarios and identifying critical points like peak demands on health systems and the need for specific resources, such as ventilation units, as shown in Fanelli and

Piazza's study in Italy (2020). These models support health systems in preparing for surges and guiding preventive measures, including controversial interventions like social distancing or lockdowns. The reliance on accurate, evidence-based models is essential for public health planning, ensuring timely, data-driven actions to mitigate the spread and impact of infectious diseases.

The COVID-19 pandemic has also highlighted the urgent need for coordinated societal efforts to fix gaps in health systems and enhance decision-making through real-time data analysis. Effective solutions rely on secure, independent digital platforms that ethically collect and analyze large-scale data, providing decision makers with actionable insights. To create a responsive digital health dashboard, the process began with forming an 8-member Citizen Scientist Advisory Council, which identified three priorities: managing COVID-19 risk at home, ensuring food security, and enhancing public service access. These digital health dashboards facilitate rapid decision-making and allow direct communication between policymakers and citizens, transforming public health policy by centering on community needs and advancing digital health equity through a citizen-focused approach (Katapally & Ibrahim, 2023). Field epidemiologists have increasingly adopted advanced digital tools and interdisciplinary collaboration, especially during the intense demands of COVID-19. As the crisis subsides, it's a moment to reflect on the profession's core values and future challenges. Renewing our commitment to rigorous epidemiology, surveillance, and applied research ensures timely, actionable evidence that upholds public health's essential mission and effectiveness (Hahné et al., 2023). This knowledge assists policymakers and health professionals worldwide in managing pandemic effects. Although researchers have produced extensive studies to model and predict COVID-19's spread, key insights remain elusive, particularly regarding prediction techniques. A literature review analyzed 69 peer-reviewed studies, revealing that most models relied on compartmental epidemiologic frameworks, with some using advanced machine learning (Ojokoh et al., 2022). While certain models accurately projected epidemic timelines in specific countries, others missed the mark. Notably, studies indicate that combining artificial intelligence with traditional models enhances prediction accuracy.

Risk communication, a vital component of epidemiology, involves translating complex health data into actionable information for policymakers and the public. During public health emergencies, effective communication strategies are essential to reduce misinformation, encourage preventive behaviors, and foster public trust (Oxman et al., 2022). Epidemiologists work with media outlets, public health agencies, and healthcare providers to communicate risks and guidelines clearly and accurately. Studies show that collaboration between epidemiologists and social services can improve risk communication, particularly in reaching vulnerable populations. For example, during the Zika virus outbreak, targeted communication efforts that involved social services reached communities at higher risk, leading to better-informed public responses and reduced transmission rates (Kirk Sell et al., 2020). Effective communication plays a crucial role in ensuring the adoption of preventive measures and reducing disease transmission during a pandemic. Miller and colleagues (2021) conducted a qualitative study to examine communication strategies used by health and government institutions and healthcare professionals

regarding COVID-19, and to understand public perceptions of these official communications. Through semi-structured interviews and focus-group discussions, the study used the Crisis and Emergency Risk Communication (CERC) model as a theoretical framework to guide data analysis. CERC, developed by the CDC, combines principles of risk and crisis communication and categorizes public health crises into five stages, with six guiding communication principles (Dubé et al., 2022). This framework aims to enhance public understanding and compliance with health measures. The COVID-19 pandemic underscored the complexities of health behavior change amidst widespread uncertainty. The high-risk nature of the virus, coupled with public fear and outrage, aligns with Sandman's formula, "Risk = Hazard + Outrage," emphasizing the need for effective crisis communication (Sandman & Lanard, 2004). However, challenges such as scientific uncertainty, misinformation, and mistrust in authorities complicated efforts to communicate effectively, a phenomenon exacerbated by the "infodemic" — the spread of both accurate and misleading information across media platforms. Studies have shown that misinformation and lack of trust diminished public confidence in health authorities, stressing the need for evidence-based communication strategies.

3- The Role of Emergency Care in Managing Public Health Crises

Emergency care departments and providers are at the forefront of crisis response. They manage acute health demands, from trauma and emergency medical conditions to surges in patient numbers during public health crises. Emergency care plays a pivotal role in triage, resource allocation, and patient stabilization. The effectiveness of emergency care services often depends on their collaboration with other sectors, including public health and social services, to provide a coordinated response that meets community needs during and after a crisis (Gooding et al., 2022). The World Health Organization's Emergency Care System Framework outlines a multi-sector approach to emergency care, covering the emergency scene (WHO, 2018), patient transport, and healthcare facilities. Effective emergency care relies on coordination across services—from bystanders and dispatchers to ambulance and hospital staff—beginning at the first sign of symptoms. In 2019, the World Health Assembly urged member states to develop systems ensuring cohesive emergency care coordination for better patient outcomes.

During public health crises, emergency care units are responsible for managing a surge in trauma cases and acute health emergencies. Natural disasters, infectious disease outbreaks, and mass casualty events place substantial demands on emergency resources. Research demonstrates that hospitals with strong triage protocols and trained emergency staff are better equipped to handle surges. For instance, studies conducted during the COVID-19 pandemic show that emergency departments in hospitals with established crisis protocols had lower mortality rates and improved patient outcomes compared to those without standardized protocols (Shrestha et al., 2020). Emergency departments also serve as the initial point of care for individuals with acute symptoms, including respiratory distress, dehydration, and severe infections, which were common in COVID-19 and other infectious disease outbreaks. The rapid assessment and treatment provided by emergency care staff are essential to minimizing severe outcomes and limiting the spread of disease in the community (Pantazopoulos et al., 2021).

Triage—the process of assessing and prioritizing patients based on the severity of their conditions—is crucial in managing healthcare resources during public health crises. Effective triage allows healthcare providers to allocate limited resources, such as ventilators, ICU beds, and medical personnel, where they are most needed. In high-stress situations, triage protocols developed in collaboration with public health agencies and community partners can help optimize patient outcomes. For example, COVID-19 triage often requires tough decisions about allocating scarce resources like ventilators and ICU beds. Triage protocols should be ethical, objective, transparent, and applied fairly. Iacorossi et al.'s study (2020) examined triage tools in pandemic emergencies, revealing no universal standard for adult or pediatric triage. Relying solely on short-term survival probability was problematic. Triage frameworks should include ethical principles like transparency, care duty, resource stewardship, planning, and justice. Clinical judgment alone can be inconsistent, but an ethical framework supports accountability and consistent decision-making, though aligning ethical and clinical criteria remains challenging. During the 2014 Ebola outbreak in West Africa, emergency care departments implemented triage systems to separate suspected Ebola patients from non-infected individuals, thus limiting cross-contamination and better managing the care of those in need (Vetter et al., 2016). Similar protocols were adopted during the COVID-19 pandemic to prioritize high-risk patients, effectively controlling hospital admissions and preventing overwhelming healthcare facilities while maintaining our commitment to providing the best possible care for all patients under challenging circumstances (Hupert et al., 2020). Emergency care is increasingly involved in multidisciplinary efforts with public health and community services, especially when managing large-scale emergencies that impact the broader community. By partnering with local health departments, emergency care facilities can ensure coordinated responses, improved patient transfers, and faster access to public health resources. In many cases, social services assist emergency departments in providing continuity of care for discharged patients who need support with housing, food, or mental health services. For example, primary health care programs for homeless populations should adopt a multidisciplinary, integrated approach that addresses mental, physical, and social health. Studies indicate that integrating primary care for homeless individuals improves chronic disease management, patient experience, and reduces hospital admissions. However, more research is needed on primary care programs specifically designed for homeless populations (Hwang & Burns, 2014). Studies highlight that collaboration between emergency care and social services leads to better health outcomes. For instance, in cases of homelessness or substance abuse, social workers embedded within emergency departments help connect patients to appropriate support services upon discharge. This approach not only improves patient recovery but also reduces the likelihood of readmissions and lowers the overall burden on emergency healthcare facilities (Jego et al., 2018).

4- The Role of Social Services in Supporting Public Health Responses

Social services address the underlying social determinants of health, which are crucial in public health responses. During crises, social service providers work to ensure that vulnerable populations, including low-income families, individuals experiencing homelessness, and the elderly, receive the resources they need. By

addressing socioeconomic barriers, social services help improve adherence to public health guidelines, reduce disparities, and enhance community resilience (Smith, 2014). Social determinants of health—such as income, education, housing, and access to healthcare—are fundamental to population health outcomes. Social service agencies play a critical role in mitigating these factors, especially during public health emergencies. For example, during the COVID-19 pandemic, social services collaborated with healthcare providers to distribute food, financial assistance, and temporary housing to individuals affected by income loss, school closures, and restricted access to healthcare (Abrams et al., 2022). Addressing socioeconomic barriers is especially important for compliance with public health measures. Research shows that individuals facing financial insecurity, lack of stable housing, or limited access to resources are less likely to adhere to preventive measures, such as social distancing and vaccination. By providing resources to mitigate these barriers, social services support public health objectives and contribute to the overall effectiveness of crisis response efforts (Tan et al., 2023). Community outreach and education are key functions of social services during public health crises. Social service organizations often work directly with communities to promote understanding and adherence to public health guidelines, particularly in high-risk or underserved areas. For instance, during the Zika virus outbreak, social service organizations played a critical role in educating communities in affected areas about mosquito control and preventive measures, thus reducing the rate of infection (Rather et al., 2017). Social services also assist with vaccination campaigns and preventive care by organizing informational events, distributing educational materials, and facilitating access to healthcare services. Studies have shown that targeted community outreach, especially when conducted in collaboration with local healthcare providers, increases vaccine uptake and compliance with health advisories (Kafadar et al., 2024). This approach is particularly effective in culturally diverse or low-income communities, where trust in traditional healthcare institutions may be lower.

Partnerships between social services and healthcare providers enable a more comprehensive public health response. Social services assist in identifying at-risk individuals, providing mental health support, and addressing social needs that may impede health. Integrated models of care, where social services are embedded within healthcare systems, have shown significant improvements in health outcomes and patient satisfaction (Liljas et al., 2019). For instance, the “Housing First” approach, which prioritizes providing stable housing to homeless individuals with chronic health issues, exemplifies a successful partnership between social services and healthcare providers. Research indicates that individuals in stable housing are more likely to access regular healthcare, adhere to medical treatments, and exhibit lower emergency room utilization rates compared to those without stable housing (Jaworsky et al., 2016). Such partnerships enable public health systems to address root causes of health inequities and build resilience within vulnerable communities. Integrated care models (ICMs) have shown measurable improvements in the quality of care for chronic patients. However, newer integration models require additional assessment to fully understand their effectiveness and impact. The introduction of a new health and social ICM enabled early case detection and expanded access to medical and social services for chronic patients. Additionally, these models

significantly enhanced patients' quality of life, treatment adherence, and reduced caregiver burden (Gavalda-Espelta et al., 2023).

Conclusion

Multidisciplinary collaboration across pharmacy, epidemiology, emergency care, and social services has become increasingly vital for effective public health responses. Through examining recent public health crises, including the COVID-19 pandemic and responses to natural disasters, this literature review has highlighted the unique contributions each field makes and the synergies that arise from coordinated efforts. Pharmacy improves accessibility to preventive services, medication, and vaccinations; epidemiology provides the data needed to track, predict, and contain disease outbreaks; emergency care addresses acute healthcare needs during crises; and social services work to mitigate the socio-economic barriers that affect health outcomes. Future research should continue to explore innovative models for collaboration and examine the long-term impact of multidisciplinary strategies on health outcomes. Ultimately, by fostering deeper and more structured partnerships across these disciplines, public health systems can be better prepared to respond to emergencies, reduce health disparities, and improve the overall health and well-being of communities.

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