

Challenges from 14 years of experience at Workers' Health Centers in basic occupational health services for micro and small enterprises in Korea: a narrative review

Jeong-Ok Kong¹, Yeongchull Choi², Seonhee Yang³, Kyunghye Jung-Choi²

¹Workers' Health Center in East Gyeonggi, Seongnam, Korea

²Department of Environmental Medicine, Ewha Womans University College of Medicine, Seoul, Korea

³With Health Welfare Social Cooperative, Daegu, Korea

Received Nov 26, 2024
Revised Jan 8, 2025
Accepted Jan 8, 2025

Corresponding author

Kyunghye Jung-Choi
Department of Environmental Medicine,
Ewha Womans University College of
Medicine, 25, Magokdong-ro 2-gil,
Gangseo-gu, Seoul 07804, Korea
E-mail: jungchoi@ewha.ac.kr

Keywords

Case managers; Occupational diseases;
Occupational health services; Republic
of Korea; Workplace

Health and safety issues in micro and small enterprises (MSEs) are recognized as a global challenge. This study aimed to examine Workers' Health Centers (WHCs) as a representative public organization providing occupational health services to MSEs in Korea. WHCs were established in 2011 after a trial period aimed at addressing occupational diseases in MSEs with limited resources. As of 2024, there are 24 WHCs, 22 branch offices, and 23 trauma counseling centers for workers. These health centers are managed by the Korea Occupational Safety and Health Agency, with their actual operation delegated to private organizations. Each WHC employs an average of 13 staff members and is organized into four specialized teams: cardiovascular disease prevention, workplace environment improvement, musculoskeletal disease prevention, and occupational stress management. These centers also offer common basic programs along with region-specific specialized initiatives. In 2023, the total cumulative number of users reached 203,877, with employees from MSEs comprising approximately 88.5% of the total. WHCs can thus be seen as playing a pivotal role as case managers of health requirements in the workplace by fostering strong relationships with MSEs and linking them to other relevant programs through a problem-solving-oriented approach. Given the limited resources of these enterprises, proactive policies and the equitable application of safety and health regulations are essential. A balanced strategy that combines regulatory enforcement with practical assistance is critical to ensure the success of WHCs in improving health and safety conditions in MSEs.

Introduction

Background

Health and safety issues in micro and small enterprises (MSEs), which account for 70 percent of total employment worldwide [1], are recognized as a significant global challenge [2–4]. According to Organization for Economic Co-operation and Development (OECD) criteria, microenterprises are businesses with fewer than 10 employees, while small enterprises have between 10 and 49 employees. Thus, MSEs are workplaces with fewer than 50 employees. To sustain themselves,

MSEs typically adopt a low-road strategy, relying on low wages and price competitiveness. They occupy a less powerful position in the global value chain compared to medium and large businesses and often bear the risks and costs transferred from their larger counterparts. With increasing pressures on working conditions, such as unstable contracts, low wages, and unpaid overtime [5], the workforce becomes increasingly vulnerable to occupational safety and health (OSH) risks. Additionally, as organizational interdependence becomes more complex and employment relationships fracture, the gap between employment contracts, employment regulations, and management controls widens. Therefore, MSEs lack the resources necessary for OSH prevention and appropriate management, leaving their employees exposed to significant risks to their well-being, along with poor working conditions and low-quality work.

In OECD countries, the rates of fatal occupational injuries in 2020 ranged from less than one to over five per 100,000 workers [6]. In the same year, Korea reported a rate of 4.65 fatal occupational injuries per 100,000 workers. Although this rate is decreasing, it remains significantly high. Similar to MSEs in other countries [7], those in Korea experience a higher incidence of occupational injuries and diseases compared to medium and large enterprises [8]. A 2022 report on industrial accidents revealed that the overall company accident rate was 0.65, while workplaces with fewer than five employees had a rate of 1.12 [9]. In contrast, enterprises with 50 or more employees all reported rates below the average. In MSEs, musculoskeletal disorders (MSDs), such as back pain, constitute almost 55% of occupational diseases, making them the most prevalent [9–11]. These are followed by hearing loss, pneumoconiosis, and cardiovascular disease (CVD). Additionally, new types of occupational diseases are emerging, including MSD, CVD, and psychological issues, which differ from the traditional chemical or metal poisoning still present in Korea, as shown by the industrial accident compensation insurance data [9]. However, it is important to note that the industrial accident compensation insurance data does not cover all individuals affected by industrial accidents, especially those with occupational diseases. Coverage is limited to those who have applied for and been granted compensation.

Efforts to prevent occupational diseases in MSEs in Korea have led to the development of three main support programs focused on occupational health: the Clean Workplace Project, financial support for work environment assessments or special medical examinations, and private contractor programs for health and Workers' Health Centers (WHCs) [12,13]. These initiatives collectively target nearly 2 million MSEs, accounting for 98% of the total, and approximately 11 million workers [14]. The Clean Workplace Project offers up to \$23,000 in financial assistance to manufacturing companies with fewer than 50 employees to enhance their OSH facilities. Additionally, financial support is provided for work environment assessments and special medical examinations specifically for MSEs. Private contractor programs for health and WHCs deliver direct occupational health services. The private contractor program for health, which operates solely in the workplace, focuses on managing chronic diseases and workplace hygiene through the services of a nurse or occupational hygienist [8]. In contrast, WHCs are situated in industrial complexes and staffed by a range of specialists including experts in occupational and environmental medicine, nurses, exercise specialists, occupational hygienists, and psychological counselors [15]. These centers offer services both onsite and at the workplace.

Objectives

Although the Korean WHC has been operational for over a decade, there is a notable scarcity of literature that systematically organizes the current status and discussions surrounding these institutions. In light of this gap, this study explores the WHC as a key public organization

providing occupational health services to MSEs in Korea.

Ethics statement

It is a literature database-based review; therefore, neither approval by the institutional review board nor obtainment of informed consent was required.

Methods

To explore the status and discussions regarding WHCs in Korea, we first used domestic and international search tools to locate WHC-focused papers and reports authored by Korean researchers. For Korean-language papers, we searched using the keywords 근로자건강센터 ("workers' health center") and 직업트라우마센터 ("trauma counseling center for workers") in Google Scholar, the DataBase Periodical Information Academic (DBPIA), the Research Information Sharing Service (RISS), the Korean Studies Information Service System (KISS), and the National Assembly Library. To identify English-language papers, we used the search terms "workers' health center and Korea" and "trauma counseling center for workers and Korea" in Google Scholar and PubMed. We also reviewed references cited in the initially identified documents, as well as official WHC operations reports published by the Korea Occupational Safety and Health Agency (KOSHA). The content of the selected papers and reports was analyzed and categorized into data on the background, development, and performance of WHCs. Papers and reports unrelated to WHCs were excluded from the analysis.

Results

Background of Workers' Health Centers

The Participatory Government, which was established in February 2003, formed the Presidential Advisory Committee on Aging and Future Society in March 2004. This committee was tasked with developing a national strategy to address the challenges of a low birth rate and an aging population [16]. In September 2004, the committee released the Healthcare System Reform Plans for Ensuring Public Health in an Aging and Future Society [17]. Included in this report was a proposal to create an industrial health management system through collaboration with the Ministry of Health and Welfare and the Ministry of Labor. To support this initiative, these ministries launched a joint project aimed at establishing an industrial health center, which would offer industrial health services funded by the National Health Promotion Fund [18].

In September 2006, the establishment review committee selected the Banwol-Sihwa area, a national industrial complex with a high concentration of MSEs, as the site for the new industrial health center. The Banwol-Sihwa Regional Center for Occupational Health opened in March 2007 [19]. From 2007 to 2009, the center was operated by KOSHA and its staff. In 2010, while KOSHA continued to oversee the center's management and provide administrative support, service provision was handled by medical staff, nurses, and industrial hygienists employed by a privately entrusted organization. By 2011, funding for the Banwol-Sihwa Regional Center for Occupational Health was not included in the National Health Promotion Fund's budget, leading to its closure after four years of operation [18].

The Ministry of Employment and Labor facilitated the establishment of a WHC to provide primary care to MSEs, funded by the Industrial Accident Compensation Insurance and

Prevention Fund. The entire process, from business planning to operation, was delegated to private operating agencies. The inaugural WHC, the Gyeonggi Western WHC, was set up in the Banwol-Sihwa Industrial Complex area, leveraging the existing infrastructure of the Banwol-Sihwa Regional Center for Occupational Health [20]. Subsequently, the Incheon WHC and Gwangju WHC were introduced in 2011 through a public offering [18,21].

Development of Workers' Health Centers

Purpose, legal basis, and funding sources of Workers' Health Centers

The purpose of the WHCs has evolved slightly in line with the operational directives of KOSHA. Initially, when WHCs were introduced in 2012, their primary function was to enhance the prevention of occupational diseases and to support the health maintenance and promotion of workers by offering basic public occupational health services. These services included counseling on preventing occupational diseases, specifically targeting workers in MSEs, which are known for their relatively weak health management systems [22]. By 2016, KOSHA had redefined the purpose of WHCs, positioning them to fulfill the responsibilities of a health officer in MSEs that are not mandated to appoint one [21]. A health officer is tasked with supporting the business owner or the person responsible for safety and health management, especially concerning technical issues, as stipulated by the Occupational Safety and Health Act. This shift marked a transition from a broad and progressive goal of providing basic occupational health services to a more focused objective aligned with the specific duties of a health officer within the Korean occupational health framework. Following the 2018 report on WHC operations, the centers' foundational purpose was no longer explicitly described [23,24]. The focus shifted from defining their "purpose" to specifying their "role," which now includes acting as health officers for MSEs and serving as health guardians for vulnerable enterprises.

The legal basis for the WHCs was established in 2013 when the Occupational Safety and Health Act was revised to include a provision allowing the Minister of Employment and Labor to establish and operate "facilities for maintaining and promoting workers' health" [25]. This revision was further detailed in Notification No. 2013-6 from the Ministry of Employment and Labor, which defined WHCs and outlined the services they offer [26]. In 2019, amendments to the Occupational Safety and Health Act broadened the range of facility users from "workers" to "persons providing labor" [27]. Subsequently, in 2020, specific guidelines for the establishment and operation of WHCs were integrated into Notification No. 2020-19 issued by the Ministry of Employment and Labor [28].

WHCs are funded through the Industrial Accident Compensation Insurance and Prevention Fund, with budgets that vary based on the size of each center. In 2023, the operating budget for each center ranged from 564 to 968 million won (approximately \$400,000–\$670,000, using 2024 exchange rates) [24]. When examining the growth of WHCs in terms of personnel and budget, the number of employees increased by 1.9 times, from 172 in 2016 to 332 in 2023. However, the budget for WHCs only grew by 1.7 times, from KRW 10.33 billion to KRW 17.774 billion over the same period [21,24].

Nationwide distribution and facilities

As of 2024, there are 24 WHCs, 22 branch offices, and 23 trauma counseling centers for workers (Table 1, Fig. 1). The expansion of WHCs began in the early 2010s, with three centers established in 2011, two in 2012, and five annually from 2013 to 2015. Since then, the growth rate has decreased, with one WHC established in 2016, two in 2020, and one in 2024. Starting in

Table 1. Workers' health centers, branch offices, and trauma counseling centers for workers by region and operating agencies in Korea

Region	Workers' Health Center (WHC)	Branch office (BO)	Trauma counseling center for workers	Operating agency
Seoul	Seoul WHC	Seoul Jung-gu BO	○	Ewha University-Industry Collaboration Foundation
	Seoul Western WHC	Seoul Seongdong BO	○	Seoul National University Research and Development Business Foundation
Busan	Busan WHC	Yongsan BO	○	Busan University Research and Business Development Foundation
Daegu	Daegu WHC	Seodaegu BO	○	Korean Association of Occupational Health Nurses, Incorporated Association
		Daegu Dalseong BO		
Incheon	Incheon WHC	Incheon Bupyeong BO	○	Yonsei University University-Industry Foundation
Gwangju	Gwangju WHC	Gwangju Gwangsan BO	○	Korean Association of Occupational Health Nurses, Incorporated Association
Daejeon	Daejeon WHC	-	○	Korean Association of Occupational Health Nurses, Incorporated Association
Ulsan	Ulsan WHC	Ulsan Buk-gu BO	○	Dong-a University Industry-Academy Cooperation Foundation
Gyeonggi-do	Gyeonggi Western WHC	Gunpo BO	○	Korea University Research and Business Foundation
	Gyeonggi Eastern WHC	Seongnam BO	○	The Catholic University of Korea, Industry-Academic Cooperation Foundation.
	Bucheon WHC	Gimpo Yangchon BO	○	The Catholic University of Korea, Industry-Academic Cooperation Foundation
		Gimpo Gochon BO		
	Gyeonggi Southern WHC	Pyeongtaek BO	○	Korea Workers' Compensation & Welfare Service Ansan Hospital
	Gyeonggi Northern WHC	Namyangju BO	○	Gachon University Industry-Academic Cooperation Foundation
Gangwon special self-governing province	Gangwon WHC	Chuncheon BO	○	Yonsei University Wonju Severance Christian Hospital
Chungcheongbuk-do	Chungbuk WHC	-	○	Korea Industrial Health Association
Chungcheongnam-do	Chungnam WHC	Asan BO	○	Dankook University Industry-Academia Cooperation Foundation
	Chungnam Western WHC	-	-	Mirae Hygiene Environment Institute Co., Ltd.
Jeonbuk special self-governing province	Jeonbuk WHC	Wanju BO	○	Korean Association of Occupational Health Nurses, Incorporated Association
Jeollanam-do	Jeonnam Eastern WHC	-	○	Won-jin Foundation for occupational diseases Green Hospital
	Jeonnam Western WHC	-	-	Mokpo National University Industry-Academic Cooperation Foundation
Gyeongsangbuk-do	Gyeongbuk Northern WHC	Gumi BO	○	Gumi Ganddong Hospital
	Gyeongsan WHC	Yeongcheon BO	○	Korean Association of Occupational Health Nurses, Incorporated Association
Gyeongsangnam-do	Gyeongnam WHC	Changwon BO	○	Teo Occupational and Environmental Medicine Center
	-	Geoje BO	○	Daewoo Medical Foundation
Jeju special self-governing province	Jeju WHC	Jeju Yeon-dong BO	○	Cheju Halla General Hospital

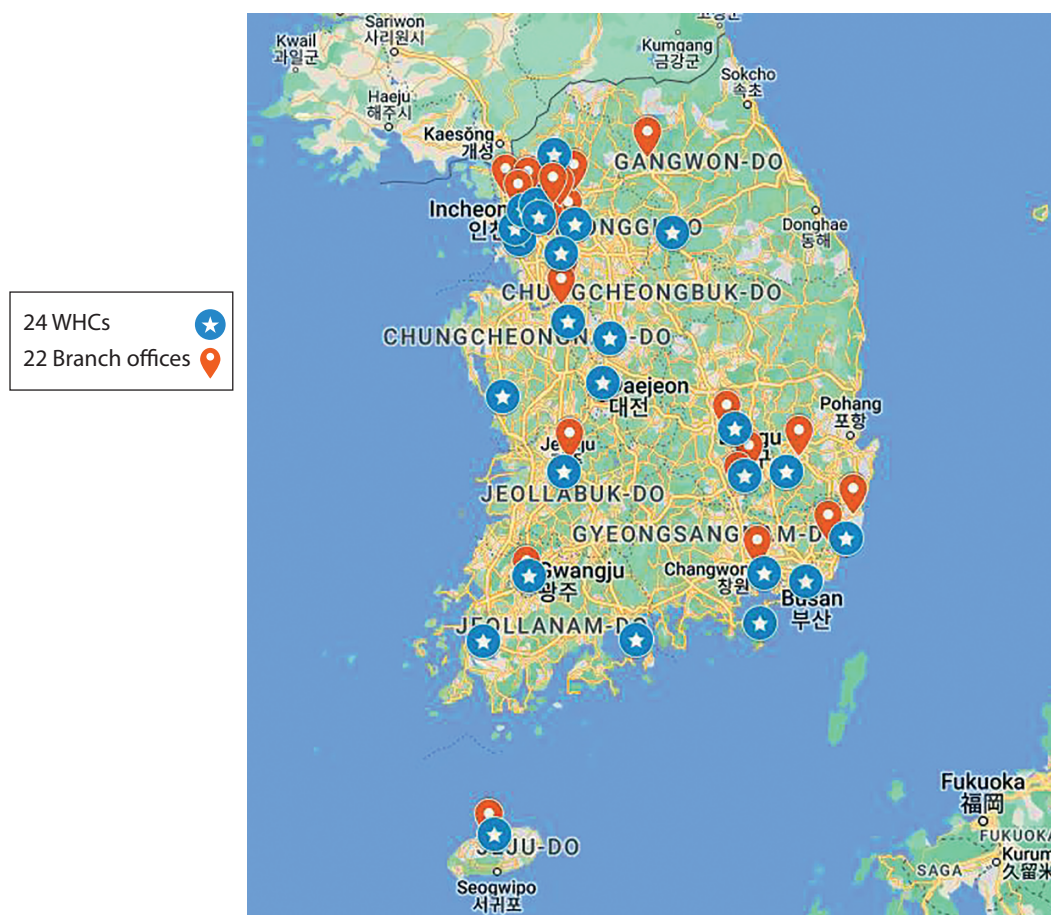


Fig. 1. Distribution of Workers' Health Centers (WHCs) in Korea.

2016, five new branch offices were established to serve workers in industrial complexes located beyond the reach of existing WHCs [21]. The years 2017 and 2023 saw the addition of 16 and one branch office, respectively. To address trauma among workers who have experienced significant industrial accidents, a pilot trauma counseling center for workers was launched in 2018 and 2019. This initiative led to the official establishment of eight institutions in 2020 [29]. The network expanded with five additional centers in 2021, one in 2023, and nine in 2024, totaling 23 operational trauma counseling centers for workers.

WHC facilities cover an area of 400 to 500 square meters, while branch offices range from 80 to 100 square meters [24]. Each center includes a front desk, separate counseling rooms for MSD and CVD prevention, an education room, an exercise room, a psychological counseling room, and a doctor's counseling room. Since WHCs are not medical facilities, they are not equipped to perform diagnostic procedures such as blood draws or X-ray examinations. However, they do have basic testing devices for consultations, exercise equipment, and protective gear for use in the workplace. Since 2018, the WHCs have been maintaining user consultation records through a web-based computer system. This system functions as an integrated platform for both WHCs and branch offices, with data centrally managed by KOSHA [30].

Management and operational staff

The managing agency, KOSHA, oversees the operational status of WHCs and manages

the Central Operation Committee. The actual operation of WHCs is delegated to private organizations, with annual contract renewals between KOSHA and these consignment agencies, ensuring a guaranteed operation period of three years [31]. KOSHA contracts with private agencies that fulfill specific qualification requirements. These agencies are categorized into four types: university-industry collaboration foundations, health-related associations, general hospitals, and hospitals of the Korea Workers' Compensation and Welfare Service [31].

As of December 2023, the total number of employees at WHCs and their branch offices was 302. This count does not include the staff at trauma counseling centers for workers or the Geoje WHC, which operates under a unique staffing structure. This brings the average staffing level to approximately 13 employees per center [24]. Each center is structured into four specialized teams: the CVD Prevention Team, which includes nurses; the Workplace Environment Improvement Team, made up of industrial hygienists; the MSD Prevention Team, staffed by physical therapists or exercise specialists; and the Occupational Stress Management Team, which comprises counseling psychologists. Additionally, each center employs physicians who provide comprehensive counseling. Centers that have a branch office are staffed with one nurse and one additional specialist. In contrast, each trauma counseling center for workers is staffed by two psychology counselors.

Among the operational personnel of WHCs, irregular workers constitute nearly 70%. Their contracts are renewed annually, leading to significant job insecurity [31,32]. In 2021, the turnover rate at WHCs was 15.8%, approximately three times higher than the overall industry average of 4.8% [31]. A 2021 survey revealed that WHC employees are dissatisfied with job security and wage fairness, yet they express considerable satisfaction with their work and job achievements. The most challenging aspects of their work include unilateral work directives from KOSHA, additional tasks stemming from government policies, rude customer behavior, and unfair treatment by contracting agencies, listed in order of difficulty [31].

Key programs and activities

The programs of a WHC are categorized into basic and regional specialization initiatives. Basic programs, implemented by all centers nationwide, encompass post-examination health counseling following general and special health examinations, work environment consulting, health counseling for CVD or MSD prevention, job stress management, education on occupational disease prevention, and monitoring of occupational disease occurrence. Regional specialization initiatives, on the other hand, are tailored to the specific needs of the region in which each center operates. For instance, the Seoul WHC offers an occupational disease prevention program tailored for workers in the printing industry, a health management program for mobile workers such as designated drivers and delivery personnel, and a health management program for care workers [24]. All programs are available both at the center and in the workplace, and can be provided either individually or in groups.

WHCs prioritize networking with a variety of community stakeholders. They share information and experiences, and coordinate activities with regional employment and labor offices of the Ministry of Employment and Labor, regional offices of KOSHA, labor unions, regional organizations, occupational health institutes, and university hospitals, among others. Public relations play a crucial role in promoting and recognizing WHCs. They publicize their activities through websites, social networking sites, leaflets, articles, videos, and TV or radio broadcasts.

Performance of Workers' Health Centers

Key performance indicators

All WHCs are evaluated annually based on performance indicators that encompass quantitative, qualitative, operational, user satisfaction, and bonus categories, as of 2023 [24]. The quantitative evaluation relies on metrics such as improvements in health levels, stabilization rates of occupational trauma, and post-examination health counseling for essential and special employment workers. The qualitative assessment evaluates the appropriateness of regional specialization programs, conducted by a panel of approximately five internal and external experts from KOSHA. The operational evaluation includes on-site inspections by KOSHA officials, who review compliance with operational plans, staffing and operations, the appropriateness of program implementation and budget execution, and personal data protection. The satisfaction survey is conducted by an external company hired by KOSHA, which performs a sample survey of users. Bonus points are awarded for the identification of potential occupational diseases or for winning awards at the Workers' Health Center Excellence Case Competition [24].

Performance of Workers' Health Centers

The number of WHC users has increased alongside the rise in the number of WHCs established (Fig. 2) [24,33,34]. In 2023, the average cumulative number of users per center reached 8,864, equating to about 35 users per day at each center. Employees of MSEs represent approximately 88.5% of the total usage of these centers. As of 2019, 42.9% of all users visited the centers for counseling, while 57.1% received this service at their workplace [35]. User satisfaction with WHCs is exceptionally high. Annually, from the end of October to the end of November, a contracted company conducts a telephone-based structured interview survey. For this survey, 80 users per WHC and 35 users per branch office are randomly selected to participate. The survey assesses various aspects such as convenience, equipment utilization, staff attitudes, service expertise, appropriateness of consultation time, and intention to reuse

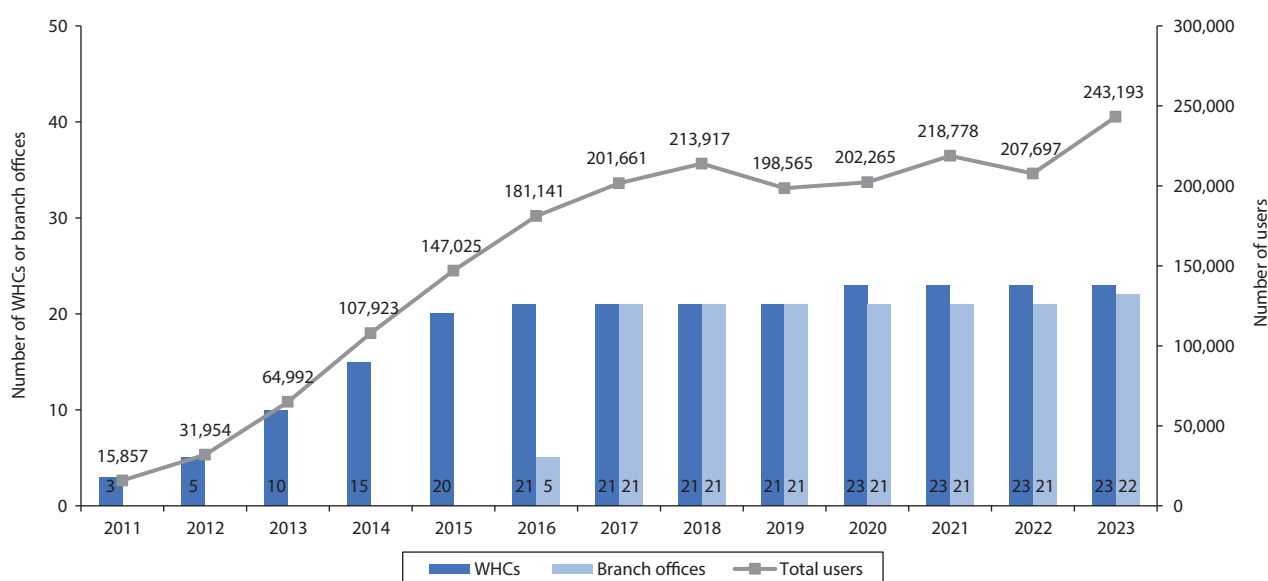


Fig. 2. The number of Workers' Health Centers (WHCs), branch offices, and users by year.

the services. In 2023, the overall satisfaction score for WHCs and branch offices was an impressive 95.4 out of 100 [24].

The WHCs have played a key role in addressing social concerns related to occupational diseases. In 2016, they carried out a health survey targeting retired workers who had been exposed to methyl alcohol [21]. This initiative was in response to several cases of methyl alcohol poisoning among subcontracted MSEs producing smartphone components [36]. Furthermore, when instances of occupational diseases such as toxic liver disease, lead, or arsenic poisoning were reported, health impact assessments were performed for retired workers from the implicated factories [30]. In cases where radon-contaminated consumer goods were detected, assessments were extended to both current and retired workers from the affected workplaces [23]. Additionally, these centers provided support for health counseling and the processing of claims for industrial accident compensation insurance.

Discussion

Over the past 14 years, Korea's WHCs have developed slowly but steadily. These centers focus on providing services to MSEs, where occupational health is often at risk. Several factors contribute to the poor occupational health and safety observed in MSEs. These include a "general and multifaceted lack of resources" [2,37,38]. First, there is a lack of understanding of legal obligations, especially those related to OSH. Additionally, there is limited interest in OSH, minimal time devoted to it, and a general indifference toward learning about improvement measures. Second, MSEs restrict workers' access to the autonomous representation of their interests through work councils and trade unions. Third, MSEs have less access to external health and safety services compared to larger enterprises. Fourth, both workers and employers in MSEs typically have limited experience. Lastly, inspections and controls are infrequent. These conditions may be worsened by other vulnerabilities such as job insecurity, the economic vulnerability of the enterprise, the ongoing threat of unemployment, limited profitability, and the prevalence of illegal work and workers associated with MSEs. All these issues are also relevant in the Korean context [15].

To ensure that the WHCs in Korea effectively fulfill their role in promoting safety and health in MSEs, several challenges must be addressed. Firstly, increasing WHC acceptance among MSEs requires an understanding of their unique characteristics and the development of diversified programs tailored to these attributes. MSE owners, often entrepreneurs and craftsmen, have a strong sense of self-identity [2]. They see themselves as responsible individuals who care for their workers and seek recognition for their commitment. Consequently, identifying workplace risks might be perceived as an indirect criticism, implying negligence or a failure to fulfill their responsibilities. This perception can lead to resistance against external health management. Recognizing these characteristics provides an opportunity to build trust with MSE owners. Engaging in open, meaningful conversations can help address their concerns and foster greater acceptance of workplace safety and health management programs [38]. A strategy that emphasizes trust and dialogue—an action-driven, problem-solving-oriented, low-cost approach—combined with aligning health and safety with other management goals, has proven to be the most successful intervention method [38]. WHCs have been providing occupational health services to communities for over 10 years, laying a foundation for establishing credibility with MSEs and creating a structure that facilitates collaboration across various professional fields. WHCs can play a crucial role in case management, building strong relationships with these enterprises, and linking them to other relevant programs, such as the Clean Workplace Project or financial support

programs for work environment assessments and special medical examinations. It is also essential to diversify initiatives, not only by increasing the number of WHC users but also by expanding into programs that prioritize addressing problems specific to MSEs.

Legal regulations should be strengthened to enhance compliance among MSEs. In Korea, these companies are partially exempt from certain regulations. To manage occupational diseases effectively, employers must establish an occupational health management system within their enterprises. The legal requirements for this vary based on the company's size and the industry in which it operates. For enterprises with more than 50 employees, health officers are appointed to provide or oversee health management services. Workplaces with fewer than 300 employees have the option to outsource their workplace health management services to external organizations. While MSEs are required to assess their work environments and conduct health checkups, they are not obligated to acquire workplace health management services. This is in stark contrast to Finland, where it is mandatory for all employers to provide comprehensive occupational health services, including preventive services, to their employees [32]. Administrative oversight often overlooks MSEs, making it challenging to effectively monitor compliance with systems such as work environment assessments and workers' health checks. This lack of supervision reduces the motivation of MSEs to implement health management measures. WHC staff often encounter refusals when attempting to arrange visits to workplaces, which they report as a significant obstacle in fulfilling their responsibilities [32]. Active government efforts to strengthen regulations and improve OSH infrastructure [39] are essential to encourage MSEs to utilize occupational health services.

Additionally, measures should be taken to increase accessibility for MSEs and their workers. In Korea, as in other countries, a significant portion of the workforce is employed by small and medium-sized enterprises; nearly 2 million companies, or 98% of all businesses, have fewer than 50 employees. Among these, approximately 62% of employees work in MSEs, accounting for about 11 million workers [14]. The country is served by 24 WHCs, each managing around 120,000 workplaces and 500,000 workers. Additionally, there is a growing number of workers in non-traditional employment relationships, such as gig workers. WHCs need to expand their services to better support these vulnerable groups. The primary role of WHCs aligns with providing basic occupational health services, delivered by community professionals [40]. These services are a fundamental right for all workers, and OSH should be upheld without discrimination based on region, employment type, workplace size, or other socioeconomic factors. However, the current number of WHCs, established to address the needs of small enterprises and disadvantaged workers, is woefully inadequate. A strategic plan for expanding WHCs should be developed with a long-term perspective in mind [32,41,42]. Furthermore, with the rising number of migrant workers, it is crucial to develop strategies to overcome language and cultural barriers to enhance the accessibility of basic occupational health services.

Finally, an essential task is to develop a long-term strategy for the advancement of WHCs, supported by the creation of an organization dedicated to this purpose. While outsourced projects have been implemented to enhance WHCs, these efforts have primarily focused on short-term improvements, leaving the directions for mid- to long-term development unaddressed [31,32,41,42]. To ensure the effective delivery of basic occupational health services, intermediate or secondary-level support structures are necessary, in addition to national-level efforts [39]. KOSHA's WHC department struggles to fulfill its role as a control tower due to limited personnel and resources [31,32]. This underscores the urgent need for a WHC support organization equipped with the expertise and capacity to serve as a central

coordinating body. This organization should be responsible for formulating long-term plans for WHCs, including their expansion and the prioritization of service subjects. It should also tackle the communication structure and governance to enhance coordination within WHCs and between WHCs, KOSHA, the Ministry of Employment and Labor, and other relevant agencies. The organization should focus on standardizing practices, developing new approaches that incorporate emerging technologies, and providing comprehensive training for WHC staff, emphasizing the center's vision, goals, and basic occupational health services. Enhancing the capacity of WHC staff to deliver both occupational safety and health services, tailored to the specific needs and circumstances of MSEs, would be beneficial. Additionally, the organization should monitor program effectiveness, disseminate best practices from various centers, and manage data generated by WHCs to inform future improvements. Establishing a robust plan to ensure job security for WHC employees is also a critical priority.

WHCs were established in Korea to prevent occupational diseases in MSEs that have minimal resources. These centers are the only public health centers dedicated to providing basic occupational health services to vulnerable workers in the country without seeking profit. To fulfill the mission of a WHC, the development of programs should consider the unique characteristics of MSEs. OSH regulations should be uniformly applied to these companies, and proactive policies should be targeted at these entities due to their resource limitations. WHCs may be essential as case managers, fostering strong relationships with MSEs and linking them to other relevant programs. By emphasizing workplace-centered connections, WHCs contribute to improving work environments, either independently or with support from KOSHA or private institutions. A problem-solving-oriented approach is crucial; a balanced strategy that integrates regulation with practical support is key to ensuring success.

ORCID

Jeong-Ok Kong: <https://orcid.org/0009-0008-9911-8637>

Yeongchull Choi: <https://orcid.org/0000-0001-5689-6932>

Seonhee Yang: <https://orcid.org/0000-0002-2487-1324>

Kyunghee Jung-Choi: <https://orcid.org/0000-0002-9800-0994>

Authors' contributions

Project administration: not applicable

Conceptualization: Kong JO, Choi Y, Yang S, Jung-Choi K

Methodology & data curation: Jung-Choi K

Funding acquisition: not applicable

Writing – original draft: Jung-Choi K

Writing – review & editing: Kong JO, Choi Y, Yang S, Jung-Choi K

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Funding

Not applicable.

Data availability

Not applicable.

Acknowledgments

Not applicable.

Supplementary materials

Not applicable.

References

1. Kok JD, Berrios M. Small matters: global evidence on the contribution to employment by the self-employed, micro-enterprises and SMEs. Geneva: International Labour Organization (ILO); 2019.
2. Walters D, Wadsworth E, Hasle P, Refslund B, Ramioul M. Safety and health in micro and small enterprises in the EU: final report from the 3-year SESAME project. Luxembourg: Publications Office of the European Union; 2018.
3. Walters D. Health and safety in small enterprises: European strategies for managing improvement. Brussels: Presses Interuniversitaires Européennes; 2001.
4. Serrano MR, Xhafa E. Industrial relations in micro and small enterprises: patterns, trends and prospects. Geneva: International Labour Organization (ILO); 2024.
5. Kim I, Min J. Working hours and the regulations in Korea. *Ann Occup Environ Med* 2023;35:e18. <https://doi.org/10.35371/aoem.2023.35.e18>
6. Our World in Data. Data page: fatal occupational injury rates [Internet]. Oxford (UK): Our World in Data; c2024 [cited 2024 Nov 10]. Available from: <https://ourworldindata.org/grapher/fatal-occupational-injuries-among-employees>
7. European Agency for Safety and Health at Work. Contexts and arrangements for occupational safety and health in micro and small enterprises in the EU: SESAME projects. Luxembourg: Publications Office of the European Union; 2016.
8. Park H, Ha E, Kim J, Jung H, Paek D. Occupational health services for small-scale enterprises in Korea. *Ind Health* 2002;40(1):1-6. <https://doi.org/10.2486/indhealth.40.1>
9. Ministry of Employment and Labor. 2022 Industrial accident status. Sejong: Ministry of Employment and Labor; 2023.
10. Yang M, Myong JP, Lee J, Park MY, Kang MY. Association between irregular working hours and work-related musculoskeletal pain: results from the 6th Korean Working Conditions Survey. *Ann Occup Environ Med* 2023;35:e21. <https://doi.org/10.35371/aoem.2023.35.e21>
11. Park J, Park J, Han B, Kim Y. Vulnerability of employees in businesses with fewer than five workers (micro-enterprises) to occupational safety and health problems. *Am J Ind Med* 2017;60(12):1056-1065. <https://doi.org/10.1002/ajim.22783>
12. Yi Y. Development of health management for small business workers. *Korean J Occup Health Nurs* 2021;30(1):28-35. <https://doi.org/10.5807/kjohn.2021.30.1.28>
13. Kang D. Problems and suggested improvement plans for occupational health service in Korea. *Ann Occup Environ Med* 2023;35:e10. <https://doi.org/10.35371/aoem.2023.35.e10>
14. Ministry of Employment and Labor. Number of establishments and workers by

- region, industry, gender, and size [Internet]. Sejong (KR): Ministry of Employment and Labor; c2022 [cited 2024 Nov 10]. Available from: https://kosis.kr/statHtml/statHtml.do?orgId=118&tblId=DT_118N_SAUPN50&conn_path=I2
15. Park J, Kim Y. The history of occupational health in South Korea. *Arch Environ Occup Health* 2019;74(1-2):50-57.
<https://doi.org/10.1080/19338244.2018.1541859>
 16. Presidential Advisory Council on Policy Planning. Response to low birthrate and aging society. Seoul: Presidential Advisory Council on Policy Planning; 2008.
 17. National Archives of Korea. Major policy records guidebook: welfare section (National Archives of Korea). Daejeon: National Archives of Korea; 2015.
 18. Kim JS, Kim DS, Gil HJ, Park YS, Sin HH, Park JT. The significance and prospects of the Workers' Health Center. *J Korean Med Assoc* 2014;57(2):159-166.
<https://doi.org/10.5124/jkma.2014.57.2.159>
 19. Lee SU, Kim DS, Gang SG. Regional Occupational Health Promotion Center in Korea for the purpose of promoting health of small-scale industry workers-assessment of the first year's results. *Ind Health* 2008;(8):54-55.
 20. Nam KC, Park JS, Koh JW, Kim JS, Park JT, Kim HJ, et al. An assessment of the needs and the affecting factors for small scale enterprise Worker's Health Centers. *Korean J Occup Environ Med* 2011;23(4):407-419.
<https://doi.org/10.35371/kjoem.2011.23.4.407>
 21. Korea Occupational Safety and Health Agency. 2016 Workers' Health Center establishment and operation comprehensive results. Ulsan: Korea Occupational Safety and Health Agency; 2017.
 22. Korea Occupational Safety and Health Agency. 2012 Workers' Health Center work performance guide. Ulsan: Korea Occupational Safety and Health Agency; 2012.
 23. Korea Occupational Safety and Health Agency. 2018 Comprehensive results of Workers' Health Center and branch operations. Ulsan: Korea Occupational Safety and Health Agency; 2019.
 24. Korea Occupational Safety and Health Agency. 2023 Comprehensive results of Workers' Health Center and branch operations. Ulsan: Korea Occupational Safety and Health Agency; 2024.
 25. Korea Legislation Research Institute. Occupational Safety And Health Act. Sejong: Korea Legislation Research Institute; 2013.
 26. Ministry of Employment and Labor. Notification No. 2013-6 of the Ministry of Employment and Labor. Sejong: Ministry of Employment and Labor; 2013.
 27. Korea Legislation Research Institute. Occupational Safety And Health Act. Sejong: Korea Legislation Research Institute; 2019.
 28. Ministry of Employment and Labor. Notification No. 2020-19 of the Ministry of Employment and Labor. Sejong: Ministry of Employment and Labor; 2020.
 29. Korea Occupational Safety and Health Agency. 2022 Comprehensive results of Workers' Health Center operations. Ulsan: Korea Occupational Safety and Health Agency; 2023.
 30. Korea Occupational Safety and Health Agency. 2017 Workers' Health Center establishment and operation comprehensive results. Ulsan: Korea Occupational Safety and Health Agency; 2018.
 31. Chung HJ, Kim SH, Rheu HC, Park JH, Lee JH, Yoo BH, et al. A study on developing improvement plans for the commissioned operation of Workers' Health Centers. Ulsan: Korea

- Occupational Safety and Health Agency; 2022.
32. Han BS, Kim SK, Choi EH, Kim HR, Jung TS, Lee JS, et al. A study on developing mid- to long-term development plans for Workers' Health Centers. Ulsan: Korea Occupational Safety and Health Agency; 2018.
 33. Korea Occupational Safety and Health Agency. 2020 Comprehensive results of Workers' Health Center and branch operations. Ulsan: Korea Occupational Safety and Health Agency; 2021.
 34. Korea Occupational Safety and Health Agency. 2021 Comprehensive results of Workers' Health Center and branch operations. Ulsan: Korea Occupational Safety and Health Agency; 2022.
 35. Korea Occupational Safety and Health Agency. 2019 Comprehensive results of Workers' Health Center and branch operations. Ulsan: Korea Occupational Safety and Health Agency; 2020.
 36. Ryu J, Lim KH, Ryu DR, Lee HW, Yun JY, Kim SW, et al. Two cases of methyl alcohol intoxication by sub-chronic inhalation and dermal exposure during aluminum CNC cutting in a small-sized subcontracted factory. *Ann Occup Environ Med* 2016;28:65.
<https://doi.org/10.1186/s40557-016-0153-9>
 37. Choi SM, Kim CW, Park HO, Park YT. Association between unpredictable work schedule and work-family conflict in Korea. *Ann Occup Environ Med* 2023;35:e46.
<https://doi.org/10.35371/aoem.2023.35.e46>
 38. Laird I, Olsen K, Harris LA, Legg S, Perry MJ. Utilising the characteristics of small enterprises to assist in managing hazardous substances in the workplace. *Int J Workplace Health Manag* 2011;4(2):140-163.
<https://doi.org/10.1108/17538351111143312>
 39. Rantanen J. Basic occupational health services. 3rd ed. Geneva: International Labour Organization (ILO); 2007.
 40. Rantanen J. Basic occupational health services: their structure, content and objectives. *Scand J Work Environ Health Suppl* 2005;(1):5-15.
 41. Joo YS, Noh SC, Lim J, Lim HJ, Jung YK, Bang YW, et al. A study on establishing operational models and developing performance indicators for the expanded installation of Workers' Health Centers. Ulsan: Korea Occupational Safety and Health Agency; 2013.
 42. Yang SH, Kang DM, Kang MY, Kim W, Kim JI, Rheu HC, et al. A study on improvement plans for the roles and functions of Workers' Health Centers. Ulsan: Korea Occupational Safety and Health Agency; 2016.