





Job analysis of vaccination health workers at public health centers and sub-centers

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Abstract

Objective: To analyze duties, tasks, and task elements of health workers in charge of vaccination at public health centers in South Korea.

Design: Descriptive study using a survey.

Sample: Health workers in charge of vaccination for more than 1 year at 254 public health centers in South Korea. Of 631 health workers, 401 responded to the questionnaire, and 379 responses were included in the analysis after excluding 22 incomplete responses.

Measurements: The Developing A Curriculum (DACUM) workshop was conducted to identify the frequency, importance, and difficulty of duties, tasks, and task elements.

Results: Four duties (vaccination promotion, vaccination administration and symptom management, execution of vaccination, and vaccination education), 18 tasks, and 81 task elements were identified. "Execution of vaccination" exhibited the highest determinant coefficient. "Implementing the budget" exhibited the highest determinant coefficient among tasks, and "dealing with an emergency in the case of adverse events" exhibited the highest determinant coefficient among task elements.

Conclusions: Duty, task, and task elements with high determinant coefficients have high educational needs. Education demands was higher for administrative work than for direct vaccination. Developing an educational curriculum based on DACUM results could contribute to the professional education of vaccine workers.

KEYWORDS

job analysis, nurses, public health, vaccination

1 | BACKGROUND

The prevalence of infectious diseases has decreased owing to the development of antibiotics and vaccines since the 1940s; however, new and re-emerging infectious diseases have recently emerged and are spreading. Severe acute respiratory syndrome in 2003, type A

influenza H1N1 in 2009 (Kang et al., 2013), and Middle East respiratory syndrome in 2015 are examples of infectious diseases that have spread between countries as new infectious diseases (World Health Organization, 2015). In addition, the coronavirus disease 2019 (COVID-19) outbreak in Wuhan, China, was associated with high infectivity and mortality rates. The World Health Organization (WHO)

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declared COVID-19 a pandemic and is leading the prevention and management of infectious diseases (World Health Organization, 2020).

South Korea complies with the international humanitarian code of conduct related to infectious diseases and has an infectious disease monitoring and management system in place to guarantee people's right to health (Korean Law Information Center, 2022a, 2022b). According to Article 10 of the Regional Public Health Act, Korea has 250 local autonomous entities, and at least one public health center should be present in each autonomous entity (Korean Law Information Center, 2022c). In 2022, there were 254 public health centers in South Korea (Ministry of Health and Welfare, 2022).

Vaccination has social and economic benefits protecting individuals against infectious diseases and preventing group infections in the community. The National Immunization Plan (NIP) in South Korea is a comprehensive program that aims to protect the population from vaccine-preventable diseases. It provides a schedule for administering vaccines to different age groups, ensuring accessibility through healthcare facilities, and promoting vaccine safety and monitoring. The NIP also encompasses public awareness and education campaigns to inform the public about the importance of immunization and encourage participation in the program (Kim, 2017; Korean Law Information Center, 2022b; Korea Disease Control and Prevention Agency, 2022a). Public health centers play a pivotal role in vaccination programs. Notably, public health centers have entrusted the delivery of many essential national vaccination programs to private medical institutions in the region and have been managing and evaluating consignment projects since 2009 (Kim, 2017; Korea Disease Control and Prevention Agency, 2022a).

Unlike community health workers in other countries, vaccination workers at public health centers administer nationally mandatory vaccinations (NIPs) to nationals and foreigners living in South Korea, as well as temporary vaccinations for specific infectious disease outbreaks as determined by the Minister of Health and Welfare (Korean Law Information Center, 2022b; Gibson et al., 2023). They also provide vaccination consignment services to medical institutions, playing an important role in achieving the NIP's mandatory vaccination goals.

Recent outbreaks and epidemics of emerging and re-emerging infectious diseases have led to policy changes and require the preparedness of those in charge of vaccination. Vaccination workers, therefore, constantly encounter changes in policies and projects and must adapt accordingly. However, no job analysis of vaccination workers has been conducted in South Korea or elsewhere. Efforts to prevent diseases through vaccination are a global trend (Tharakan, 2019), and vaccination workers are emerging as an important resource. The developing a curriculum (DACUM) approach involves analyzing the job of vaccination workers and developing a curriculum based on the results of the job analysis. This would allow the implementation of a training process for vaccination workers based on the needs of the target audience.

The DACUM process is a priority step toward developing a curriculum based on the work performed. It involves a panel of experts working together to create a list of duties, tasks, and task elements performed in a specific job (DeOnna, 2002; Hwang et al., 2021; Kim et al., 2008; Norton, 1997, 1999). Accordingly, we conducted a focus

group interview with a group of experts with theoretical and practical experience and knowledge about the vaccination task at public health centers. The experts performed a job analysis of the vaccination tasks. Based on this analysis, we aim to develop a vaccination curriculum and strengthen the competency of workers.

2 | METHODS

2.1 | Study design

A descriptive study using the DACUM approach (Figure 1).

2.2 | Study process

According to the DACUM method (Norton, 1997), the following five phases were used: committee formation; workshop preparation; workshop; validation of duties, tasks, and task elements by an external expert panel; and a field survey.

2.3 | Committee formation

Two committees were organized. The facilitator committee comprised five experts in education, public health, and community nursing (three community health nursing professors, one public health professor, and one infectious disease control specialist) with more than 20 years of teaching and practical experience in the field.

The second committee, the subject matter expert (SME) committee, comprised seven health workers (including city/county/district public health center health workers) who had performed vaccination-related jobs at a public health center for at least 5 years. The workers included four full-time nurses, two nonregular nurses, and one medical technician. A writer was also present to transcribe the opinions of the committee members.

2.4 | Workshop preparation

Before the DACUM workshop, the facilitator committee attempted to understand the work contents of health workers undertaking vaccinations at public health centers in two dimensions. First, they reviewed the related literature. Second, they discussed work related to vaccination with 21 health workers in charge of vaccination-related work at public health centers located in cities, counties, or districts. These included 11 full-time nurses, nine nonregular nurses, and one medical technician.

Based on the literature review by Fagundes et al. (2018) and Health Protection Agency (2005), health worker practices in vaccination were classified into four categories—vaccination promotion, vaccination administration, management/supervision, and vaccination education. Therefore, this study used these categories as a clustering frame of

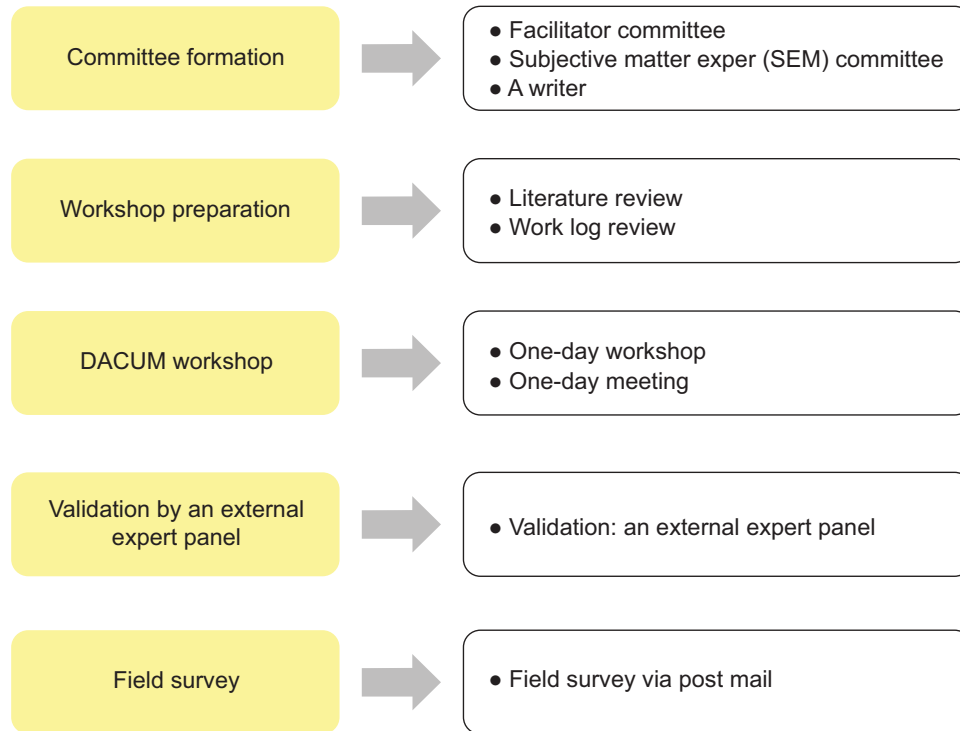


FIGURE 1 Study process for job analysis. [Color figure can be viewed at wileyonlinelibrary.com]

preliminary duties for tasks and task elements. The facilitator committee listed the contents of the work log under the framework of four duties.

2.5 | DACUM workshop: content derivation of duties, tasks, and task elements

The facilitator committee invited the committee of health workers (SMEs) and held a 1-day workshop for job analysis. One facilitator participated as the host and provided orientation to the SME committee. Four of the facilitator committee members encouraged the active involvement of the participants (SMEs) and determined their job-related duties and tasks. First, the SMEs brainstormed their work in the field, referring to the contents of the previously listed work log. Second, they discussed and agreed on the duties, tasks, and task elements required to be retained, added, or eliminated. Finally, four duties, 17 tasks, and 72 task elements were derived. After the workshop, the facilitators held a 1-day meeting and revised the terms used for the tasks and their elements.

2.6 | Validation of the duties, tasks, and task elements by an external expert panel

The facilitator committee invited 11 external experts (heads or supervisors of public health centers) for a group discussion to validate the preliminary-derived duties and tasks. After a 3-h discussion, one task

was divided into two tasks, and several task elements were included or split. In addition, the duty names of “vaccination administration” and “management/supervision” were revised to “administration of vaccination and management of symptoms” and “execution of vaccination,” respectively, in accordance with the public health center system in South Korea. Finally, the contents of the four duties with 18 tasks and 81 task elements were validated by an external expert panel: vaccination promotion (two tasks and seven task elements), administration of vaccination and management of symptoms (five tasks and 25 task elements), execution of vaccination (eight tasks and 38 task elements), and vaccination education (three tasks and 11 task elements).

2.7 | Field survey

2.7.1 | Participants and data collection process

Overall, 631 health workers were in charge of vaccination-related work in the 254 public health centers in South Korea. The inclusion criteria for this survey were workers who had worked as vaccination workers in a public health center for at least 1 year.

The package of questionnaires, including information regarding this survey and a formal consent form, was sent to the health workers via regular postal mail. If potential participants agreed to participate in this study and satisfied the inclusion criteria, they were asked to sign the consent forms and respond to the questions. They were then asked to place the completed questionnaires and signed consent form in a

return envelope and mail it back. A mail survey was conducted between June and October 2020.

2.7.2 | Questionnaires

The participants were asked to respond to the frequency of each task element on a four-point Likert scale from 1 to 4 (not at all, sometimes, frequently, and always). The importance of each task element was assessed on a four-point Likert scale ranging from 1 to 4 (not important, a little important, important, and very important). Finally, the participants were asked to respond to the difficulty of each task element on a four-point Likert scale from 1 to 4 (very easy, easy, difficult, and very difficult). Higher scores indicate higher levels of frequency, importance, and difficulty, respectively. A determinant coefficient was used to identify the highest educational needs perceived by the participants at the levels of duty, task, and task elements. The participants' demographic information was also collected.

2.7.3 | Statistical analysis

Data were analyzed using SPSS (Version 25, IBM Corp., Armonk, NY, USA). The frequency, importance, and difficulty of duties, tasks, and task elements were analyzed using descriptive statistics. The determinant coefficients at the levels of duty, task, and task elements were calculated by multiplying the mean score of each importance and difficulty. In an ancillary analysis, the scores of the duties by job type were analyzed using one-way analysis of variance, and Scheffe's test was used for posthoc analysis.

2.7.4 | Ethical considerations

The institutional review board of Inje University approved this study (approval no. INJE 2019-06-013-002).

3 | RESULTS

3.1 | Participants

Overall, 401 participants responded to the questionnaire, with a participation rate of 63.5%. Among the 401 participants, 22 were excluded because of missing values for 20% or more of the total questions.

Table 1 presents the general characteristics of the study participants. All participants (100%) were women, and the average age was 37.59 ± 8.8 years. Most participants had a bachelor's degree (64.9%). Furthermore, 48.8% of participants were full-time nurses, 35.1% were nonregular nurses, and 16.1% were classified as "other." Regarding the location of community health centers, 38% of the participants worked in the district. The participants had worked at community health cen-

TABLE 1 General characteristics of participants (N = 379).

| Variable | Categories | n (%) | M ± SD |
|---|---|-------------|-------------|
| Sex | Male | 0 | |
| | Female | 379 (100.0) | |
| Age (year) | 20s | 86 (22.7) | 37.59 ± 8.8 |
| | 30s | 139 (36.7) | |
| | 40s | 109 (28.8) | |
| | 50s | 43 (11.3) | |
| | Over 60s | 2 (0.5) | |
| Educational status | High school graduate | 9 (2.4) | |
| | 3-year college degree | 116 (30.6) | |
| | Bachelor's degree | 246 (64.9) | |
| | Master's degree and above | 8 (2.1) | |
| Job types | Full-time nurse | 185 (48.8) | |
| | Non-regular nurse | 133 (35.1) | |
| | Other (including public health officials, pharmacists, and medical technicians) | 61 (16.1) | |
| Location of public health centers | City | 134 (35.4) | |
| | County | 101 (26.6) | |
| | District | 144 (38.0) | |
| Working experience at public health centers (years) | <5 years | 223 (58.8) | 6.1 ± 6.9 |
| | 5–9 years | 74 (19.5) | |
| | 10–14 years | 36 (9.5) | |
| | 15–19 years | 21 (5.5) | |
| | ≥20 years | 25 (6.6) | |
| Vaccination career experiences (years) | <5 years | 327 (86.3) | 2.1 ± 2.8 |
| | 5–9 years | 37 (9.8) | |
| | 10–14 years | 13 (3.4) | |
| | ≥15 years | 2 (0.5) | |

ters for an average of 6.1 ± 6.9 years. Approximately 86.3% of the participants had worked for vaccination services for <5 years.

3.2 | Determinant coefficients of duties

Table 2 presents the mean scores and determinant coefficients of the duties. The administration of vaccination and management of symptoms demonstrated the highest mean score for frequency and importance, and execution of vaccination showed the highest score for difficulty. The determinant coefficient of duties was highest for execution of vaccination, followed by administration of vaccination

TABLE 2 Determinant coefficients of duties and their ranking ($N = 379$).

| Duty | Frequency $M \pm SD$ | Importance $M \pm SD$ | Difficulty $M \pm SD$ | Determinant coefficient | Ranking |
|--|----------------------|-----------------------|-----------------------|-------------------------|----------|
| Vaccination promotion | 2.04 ± 0.63 | 2.87 ± 0.58 | 2.57 ± 0.50 | 7.38 | 4 |
| Administration of vaccination and management of symptoms | 3.12 ± 0.66 | 3.42 ± 0.44 | 2.61 ± 0.48 | 8.93 | 2 |
| Execution of vaccination | 2.17 ± 0.66 | 3.23 ± 0.52 | 2.95 ± 0.46 | 9.53 | 1 |
| Vaccination education | 2.09 ± 0.60 | 3.12 ± 0.54 | 2.73 ± 0.51 | 8.52 | 3 |

SD, standard deviation.

and management of symptoms, vaccination education, and vaccination promotion.

3.3 | Determinant coefficients of tasks

Table 3 shows that the highest determinant coefficient among all tasks was 11.02 for “implementing (carrying out) the budget.” In addition, the tasks of “performing administration for promotion” ($p = 7.59$), “managing adverse events” ($p = 10.86$), and “training participants” ($p = 8.71$) demonstrated the highest determinant coefficient for duties of vaccination promotion, administration of vaccination and management of symptoms, and vaccination education, respectively.

3.4 | Determinant coefficients of task elements

Table 4 presents the determinant coefficients of the task elements (see Table S1 for the mean scores for each task element’s frequency, importance, and difficulty). The top three determinant coefficients among all tasks eliminated were dealing with an emergency in the case of adverse events (11.68), managing inoculators showing adverse events (11.56), and estimating drug demands (11.25).

3.5 | Differences in each frequency, importance, and difficulty score and determinant coefficients of the duties according to job type

The differences in each frequency, importance, and difficulty score of the duties according to job type are presented in Table 5. There was a significant difference in the frequency ($F = 33.08, p < .001$) and difficulty ($F = 3.31, p = .04$) scores of “vaccination promotion” by job type. The result of the posthoc analysis showed that full-time nurses and other employees performed “vaccination promotion” more frequently than nonregular nurses. Nurses found it more difficult to promote vaccinations. Additionally, there were significant differences in the frequency ($F = 30.49, p < .001$) and importance ($F = 14.31, p < .001$) scores of “administration of vaccination, management of symptoms.” According to the posthoc analysis, nonregular nurses considered that “administration of vaccination and management of symptoms” were

more important and performed a greater number of those tasks than full-time nurses and other employee groups. Regarding “execution of vaccination,” there was a significant difference in the frequency scores by job type ($F = 62.29, p < .001$). The posthoc test demonstrated that full-time nurses and other groups performed more administrative tasks related to vaccination management than the nonregular nurse group.

Table 6 presents the determinant coefficients of duties according to job type (see Tables S2 and S3 for the determinant coefficients of tasks and task elements according to job type, respectively). Of all duties, the highest determinant coefficient was observed for “execution of variance” in the full-time nurse (9.66) and nonregular nurse (9.41) groups, respectively.

4 | DISCUSSION

This study attempted to analyze the duties of health workers in charge of vaccination at public health centers. According to the DACUM job analysis, the job of vaccination health workers at public health centers was categorized into duties, tasks, and task elements. The job analysis revealed four duties, 18 tasks, and 81 task elements of public health workers who were engaged in vaccination work at a public health center.

Vaccination programs delivered by public health centers in South Korea are specified in the Regional Public Health Act as a task for public health centers to prevent and manage infectious diseases (Korean Law Information Center, 2022b, 2022c). Vaccination is managed by public health centers (Kim et al., 2009).

Although there have been changes in public health center immunization work, such as the implementation of the National Mandatory Immunization Program, there has been no research on the types of work performed by vaccination health workers in public health centers. Therefore, this study is the first to analyze the work of public health workers undertaking vaccinations at public health centers. It is meaningful that the results were derived by collecting data from vaccination workers at 254 city, county, and district public health centers nationwide.

The derived duties were vaccination promotion, administration of vaccination and management of symptoms, execution of vaccination, and vaccination education. These results are difficult to compare

**TABLE 3** Determinant coefficients of tasks within each duty and overall ranking ($N = 379$).

| Duty | Task | Frequency $M \pm SD$ | Importance $M \pm SD$ | Difficulty $M \pm SD$ | Determinant coefficient | Ranking |
|--|--|-------------------------|--------------------------|--------------------------|----------------------------|---------|
| Vaccination promotion | - Performing administration for promotion | 1.89 \pm 0.75 | 2.87 \pm 0.64 | 2.64 \pm 0.56 | 7.59 | 17 |
| | - Undertaking promotional activities | 2.44 \pm 0.68 | 2.88 \pm 0.62 | 2.40 \pm 0.59 | 6.90 | 18 |
| Administration of vaccination and management of symptoms | - Preparing before vaccination | 3.48 \pm 0.80 | 3.57 \pm 0.54 | 2.28 \pm 0.62 | 8.14 | 15 |
| | - Managing adverse events | 2.16 \pm 0.69 | 3.36 \pm 0.59 | 3.23 \pm 0.59 | 10.86 | 2 |
| | - Managing the injection room | 3.43 \pm 0.74 | 3.38 \pm 0.52 | 2.49 \pm 0.56 | 8.44 | 11 |
| | - Managing the vaccinated persons | 2.96 \pm 0.77 | 3.17 \pm 0.56 | 2.66 \pm 0.57 | 8.41 | 12 |
| | - Administering direct inoculation | 3.26 \pm 0.85 | 3.56 \pm 0.54 | 2.56 \pm 0.61 | 9.12 | 8 |
| Execution of vaccination | - Managing drug purchases | 2.63 \pm 0.88 | 3.28 \pm 0.60 | 2.79 \pm 0.58 | 9.16 | 7 |
| | - Inspecting drugs, consumables | 2.98 \pm 0.76 | 3.45 \pm 0.54 | 2.39 \pm 0.67 | 8.25 | 13 |
| | - Distributing, retrieving vaccines | 2.40 \pm 0.88 | 3.14 \pm 0.68 | 2.58 \pm 0.69 | 8.10 | 16 |
| | - Implementing (Carrying out) the budget | 1.96 \pm 1.06 | 3.41 \pm 0.73 | 3.23 \pm 0.72 | 11.02 | 1 |
| | - Managing human resources | 1.80 \pm 0.88 | 3.16 \pm 0.72 | 3.05 \pm 0.69 | 9.65 | 5 |
| | - Managing business | 2.10 \pm 0.87 | 3.16 \pm 0.64 | 3.15 \pm 0.58 | 9.97 | 4 |
| | - Conducting vaccination business led by local governments | 1.66 \pm 0.79 | 3.10 \pm 0.72 | 3.30 \pm 0.60 | 10.22 | 3 |
| | - Managing consignment agencies | 2.07 \pm 0.88 | 3.16 \pm 0.62 | 2.93 \pm 0.62 | 9.27 | 6 |
| Vaccination education | - Completing vaccination training | 2.02 \pm 0.84 | 3.28 \pm 0.64 | 2.58 \pm 0.66 | 8.48 | 10 |
| | - Training participants | 2.48 \pm 0.69 | 3.11 \pm 0.58 | 2.8 \pm 0.57 | 8.71 | 9 |
| | - Training-related personnel | 1.66 \pm 0.71 | 2.91 \pm 0.73 | 2.83 \pm 0.66 | 8.22 | 14 |

Numbers in bold: the highest determinant coefficient in each duty.

directly with previous findings as no previous study has been conducted in the same population.

Among the 12 core topics in the immunization training curriculum for healthcare workers in the UK (Health Protection Agency, 2005), the training topics centered on the competency of vaccinated health workers are “communicating with patients and parents,” “storage and handling of vaccine,” “correct administration of vaccines,” “anaphylaxis and other adverse events,” “documentation, record keeping and reporting,” and “strategies for improving immunization rates.” Among the duties determined in the present study, the training topics corresponding to vaccination education were “communicating with patients and parents,” and “administration of vaccine and management of symptoms” corresponds to “storage and handling of vaccine,” “correct administration of vaccines,” “anaphylaxis and other adverse events.” The “documentation, record keeping and reporting” training topic corresponds to the “execution of vaccination” duty, and the “strategies for

improving immunization rates” topic corresponds to the “vaccination promotion” duty; therefore, the training core topics correspond to all four duties presented in this study. It was confirmed that the results of this study were included in the list to ensure the comprehensiveness of a vaccination health worker’s job.

In Canada, immunization competencies for immunization health professionals were classified into three domains and 14 competencies (Public Health Agency of Canada, 2008). The three domains were “application of basic biomedical science to immunization,” “essential immunization practices,” and “contextual issues relevant to immunization.”

Competencies corresponding to “application of basic biomedical science to immunization” included basic biomedical knowledge about immunization, such as “vaccine-preventable disease” and “the immune system and vaccines.” This domain was not identified in the job analysis of this study, which centered on the list of tasks that vaccination health

TABLE 4 Determinant coefficients of task elements within each task and overall ranking (N = 379).

| Duty | Task | Task elements | Determinant coefficients | Ranking |
|--|--|--|--|-------------|
| Vaccination promotion | Carrying out (implementing) administration for promotion | - Drafting public information (writing a promotional draft) | 7.78 | 71 |
| | | - Requesting promotional material production | 6.80 | 79 |
| | | - Cooperation with related administrative agencies | 8.52 | 50 |
| | | - Executing promotional budget | 7.94 | 69 |
| | | - Reporting promotional results | 7.04 | 78 |
| | | Doing promotional activities | - Making promotional calls, sending emails, texts, and newsletters | 7.67 |
| | | - Participating in promotional campaigns | 6.16 | 80 |
| Administration of vaccination, management of symptoms | Preparing before vaccination | - Registering for vaccinations | 7.46 | 76 |
| | | - Explaining vaccination-related | 9.17 | 32 |
| | | - Confirming inoculators | 7.75 | 72 |
| | | - Computerized management of inoculators | 8.19 | 66 |
| | Managing adverse events | - Handling civil appeals | 10.31 | 16 |
| | | - Giving information on how to apply for and receive compensation for damages | 10.72 | 10 |
| | | - Managing inoculators showing adverse events | 11.56 | 2 |
| | Managing the injection room | - Managing drugs and supplies | 9.36 | 28 |
| | | - Issuing certificates | 5.86 | 81 |
| | | - Computerized management of general drugs, consumables, and vaccination information | 8.57 | 47 |
| | | - Handling civil appeals | 10.20 | 17 |
| | Managing the vaccinated persons | - Giving information on vaccinations for domestic and foreign travelers | 8.56 | 48 |
| | | - Encouraging inoculators (scheduled) | 9.03 | 36 |
| | | - Checking the vaccination history of elementary and middle school students | 7.86 | 70 |
| | | - Managing missing participants from computerized inputs | 8.38 | 54 |
| | | - Carrying out free of charge (on-schedule, temporary) vaccinations | 8.38 | 54 |
| | | - Carrying out vaccinations for foreigners | 8.22 | 64 |
| | Administering direct inoculation | - Selecting inoculators | 8.38 | 54 |
| | | - Checking for history, duplicate vaccination of inoculators | 8.80 | 42 |
| | | - Checking vaccination drugs | 8.82 | 41 |
| - Checking for abnormalities and allergic reactions to vaccination drugs | | 9.52 | 25 | |
| - Applying for the vaccination area (spot) | | 8.68 | 46 | |
| - Preparing vaccines for vaccination | | 8.43 | 53 | |
| - Nursing after the vaccinations | | 8.74 | 44 | |
| - Dealing with an emergency in the case of adverse events | | 11.68 | 1 | |
| Execution of vaccination | Managing drug purchases | - Estimating drug demands | 11.25 | 4 |
| | | - Applying for drug purchase requests | 9.11 | 33 |
| | | - Applying for drug purchase accounting approvals | 9.05 | 35 |
| | | - Inspecting drugs | 8.36 | 60 |
| | | - Reporting drug usage | 8.21 | 65 |

(Continues)



TABLE 4 (Continued)

| Duty | Task | Task elements | Determinant coefficients | Ranking |
|--|--|---|--------------------------|---------|
| | Checking drugs, consumables | - Checking expiration dates | 8.29 | 62 |
| | | - Disposing of unusable (impossible) drugs | 8.12 | 68 |
| | | - Requesting to dispose of medications | 7.61 | 75 |
| | | - Managing vaccine refrigerators at public health centers | 8.95 | 38 |
| | Distributing and retrieving vaccines | - Distributing to consignment agencies | 8.52 | 50 |
| | | - Distributing to public health care | 7.35 | 77 |
| | | - Retrieving distributed vaccines | 8.38 | 54 |
| | Implementing the budget | - Establishing the budget | 11.28 | 3 |
| | | - Settling the account | 11.08 | 5 |
| | | - Calculating the account | 11.05 | 6 |
| - Returning | | 10.78 | 9 | |
| - Reporting of the settlement | | 10.85 | 7 | |
| Managing human resources | - Publishing a job offer | 9.58 | 24 | |
| | - Recruiting | 9.83 | 20 | |
| | - Managing labor cost payments | 9.50 | 26 | |
| Managing business performances | - Managing government joint evaluation indicators | 10.79 | 8 | |
| | - Writing business plans | 10.34 | 15 | |
| | - Sending the data requested by the Congress (National Assembly) | 9.70 | 21 | |
| | - Reporting business performances | 8.78 | 43 | |
| | - Writing business plans | 10.37 | 14 | |
| Conducting the vaccination business led by the local government | - Writing plans | 10.40 | 12 | |
| | - Requesting resolutions from the social security council | 9.67 | 23 | |
| | - Writing ordinances | 10.57 | 11 | |
| | - Proposing business announcements (plan) | 10.10 | 18 | |
| Managing consignment agencies | - Implementing the business | 10.40 | 12 | |
| | - Writing public announcements for consignment agencies | 9.02 | 37 | |
| | - Approving and terminating consignment agency contracts | 9.20 | 30 | |
| | - Monitoring consignment agencies (supervision, inspection) | 10.00 | 19 | |
| | - Providing the consignment agency training, promotional materials | 8.54 | 49 | |
| | - Operating meetings with local consignment agencies | 8.87 | 40 | |
| | - Examining consignment agency costs | 9.48 | 27 | |
| | - Paying consignment agency fees | 9.34 | 29 | |
| Vaccination education | Completing vaccination training | - Recovering consignment agency expenses | 9.69 | 22 |
| | | - Completing basic training | 8.47 | 52 |
| | | - Completing continuing education | 8.37 | 58 |
| | | - Completing computerized training | 8.35 | 61 |
| | Training participants | - Completing influenza training (education) | 8.74 | 44 |
| | | - Consulting over the phone | 9.18 | 31 |
| | | - Training community groups | 8.29 | 62 |
| | | - Consulting visiting inoculators | 9.06 | 34 |
| | Training related personnel | - Answering website inquiries | 8.37 | 58 |
| | | - Training volunteers | 7.67 | 73 |
| - Training school nurses | | 8.15 | 67 | |
| - Training fixed-term employees, public service employees, and human resources | | 8.90 | 39 | |

Numbers in bold: the highest determinant coefficient in each task.

TABLE 5 Differences in frequency, importance, and difficulty scores of duties according to job type.

| Duty | Full-time nurses ^a (n = 185) | Non-regular nurses ^b (n = 133) | Others ^c (n = 61) | F(p) | Post-hoc analysis |
|--|--|--|---------------------------------|-------------------------|----------------------|
| Vaccination promotion | | | | | |
| Frequency | 2.25 ± 0.59 | 1.72 ± 0.55 | 2.14 ± 0.64 | 33.08 (<.001) | a,c > b |
| Importance | 2.85 ± 0.52 | 2.94 ± 0.68 | 2.82 ± 0.57 | 1.30 (.273) | |
| Difficulty | 2.54 ± 0.46 | 2.65 ± 0.56 | 2.46 ± 0.47 | 3.31 (.04) | a, b > c |
| Administration of vaccination, management of symptoms | | | | | |
| Frequency | 2.96 ± 0.69 | 3.45 ± 0.35 | 2.89 ± 0.79 | 30.49 (<.001) | a,c < b |
| Importance | 3.34 ± 0.43 | 3.57 ± 0.32 | 3.30 ± 0.58 | 14.31 (<.001) | a,c < b |
| Difficulty | 2.63 ± 0.42 | 2.57 ± 0.55 | 2.64 ± 0.49 | 0.71 (.493) | |
| Execution of vaccination | | | | | |
| Frequency | 2.46 ± 0.61 | 1.74 ± 0.47 | 2.29 ± 0.64 | 62.29 (<.001) | a,c > b |
| Importance | 3.24 ± 0.41 | 3.20 ± 0.64 | 3.24 ± 0.50 | 0.25 (.782) | |
| Difficulty | 2.98 ± 0.41 | 2.94 ± 0.53 | 2.89 ± 0.46 | 0.91 (.405) | |
| Vaccination education | | | | | |
| Frequency | 2.15 ± 0.63 | 2.04 ± 0.56 | 2.03 ± 0.59 | 1.63 (.198) | |
| Importance | 3.12 ± 0.49 | 3.14 ± 0.61 | 3.02 ± 0.56 | 1.05 (.352) | |
| Difficulty | 2.75 ± 0.48 | 2.73 ± 0.55 | 2.68 ± 0.53 | 0.37 (.690) | |

TABLE 6 Determinant coefficients of duties and their ranking according to job type (N = 379).

| Duty | Full time nurse | | Non-regular nurse | | Others | |
|---|-------------------------|----------|-------------------------|----------|-------------------------|----------|
| | Determinant coefficient | Ranking | Determinant coefficient | Ranking | Determinant coefficient | Ranking |
| Vaccination promotion | 7.24 | 4 | 7.79 | 4 | 6.94 | 4 |
| Administration of vaccination and management of symptoms | 8.78 | 2 | 8.29 | 3 | 8.71 | 1 |
| Execution of vaccination | 9.66 | 1 | 9.41 | 1 | 8.12 | 2 |
| Vaccination education | 8.58 | 3 | 8.57 | 2 | 8.09 | 3 |

workers perform themselves and, therefore, did not include duties or tasks related to vaccination knowledge.

The “essential immunization practices” domain includes “communication,” “storage and handling of immunization agents,” “administration of immunizing agents,” “documentation,” and “populations requiring special consideration,” corresponding to the duty of “administration of vaccination and management of symptoms” in this study. On comparing these competencies with the tasks of the “administration of vaccination and management of symptoms” duties in this study, the competencies for performing direct inoculation are similar, but the tasks of confirming inoculators, computerized listing, and contact, in addition to direct inoculation, such as “managing the injection room” and “managing the vaccinated person,” differ for South Korean vaccination health workers. Licensed nurses can perform all tasks of “administration of vaccination and management of symptoms” in South Korea, but other health workers only perform tasks, such as computerized listing and contacting vaccinated people.

The “contextual issues relevant to immunization” domain corresponds to the “vaccination administration” duty in this study. It also included content related to understanding the Canadian immunization system as well as legal and ethical knowledge.

The United Nations Children's Fund (UNICEF) and WHO defined the role of public health workers in COVID-19 vaccination as planning and coordination, “identification of target population,” vaccine acceptance and uptake, and community mobilization for service delivery (World Health Organization & United Nations Children's Fund, 2021). Therefore, the contents of the duty of our study were included based on the roles of public health workers in COVID-19 vaccination, excluding the “administration of vaccination and management of symptoms.” The administration of vaccination and management of symptoms is a duty that only medical personnel can perform. The report published by UNICEF and the WHO targeted community health workers, including medical personnel; therefore, direct vaccination work was excluded. However, in the curriculum (Centers for



Disease Control and Prevention, 2022) and guidebook (Public Health Agency of Canada, 2008) for medical personnel who perform vaccination directly in the United States and Canada, the “administration of vaccination and management of symptoms” duty is classified as an essential education content. An integrative review has classified the themes of vaccination-related studies into vaccination coverage, vaccine administration, management/supervision, and vaccination education (Fagundes et al., 2018). Although the vaccination laws and systems were different in each country, the common tasks performed were similar.

For most tasks and task elements, the determinant coefficients and frequencies for each duty did not match. Tasks with low frequency generally had a high determinant coefficient. A high degree of the determinant coefficient can be interpreted as a job with high educational needs that the participant recognizes as important but difficult to perform.

Educational needs typically influenced by the complexity and intensity of tasks or duties. More challenging tasks or duties demand higher knowledge and skills, along with increased effort and time. This is directly reflected in the importance and difficulty of the tasks or duties. The determinant coefficient fully encompasses these aspects of importance and difficulty; thus, a high determinant coefficient indicates that the task or duty necessitates a higher educational level.

The present results indicate that the duty with the highest determinant coefficient reflecting importance and difficulty was execution of vaccination, although its frequency was the second highest among the four duties. In addition, it was confirmed to be the duty with the highest demand for job education. These results confirmed that health workers vaccinating at public health centers participate in the national mandatory vaccination project to perform administrative tasks to conduct budgets, manage the workforce, and manage project performance (Lee, 2021). As the aim of the vaccination project of South Korea is to protect the public from infectious diseases by improving the mandatory vaccination rate, budgeting by estimating the population and distributing vaccines to medical institutions (Korea Disease Control and Prevention Agency, 2022a) have become major public health tasks.

The vaccination education for health workers in public health centers in South Korea involves a comprehensive training program that covers the principles of vaccination, importance of vaccination in public health, and specific protocols and procedures for administering different types of vaccines (Kim, 2017). However, this educational program did not include the contents of budget management and workforce management, which are items with high educational needs according to the results of this study.

The determinant coefficient was highest for the task “implementing (carrying out) the budget.” This task had a low frequency but high determinant coefficient.

Task elements of “implementing the budget” consisted of “establishing the budget,” “settling the account,” “calculating the account,” “returning,” and “reporting of the settlement,” and “establishing the budget” had the highest determinant coefficient. Saeki et al. (2007) classified the professional competencies of public health nurses into interpersonal health support and community health sup-

port/administration, and they reported administrative tasks as essential for public health nurses. Han et al. (2016) reported that, compared to past trends, public health nurses in South Korea experienced a decrease in direct nursing, such as medical treatment support and vaccination. In contrast, the roles of administrators and managers, including those involved in planning, increased.

According to the results of this study, vaccination health workers at public health centers had the highest educational requirements for various tasks. These tasks ranged from setting up budgets by type, such as the main budget and supplementary budget, to settlement and reporting among administrative tasks.

Of the four duties, the determinant coefficient for “administration of vaccination and management of symptoms” was the second highest, and the frequency and importance were the highest. It was confirmed that the public health center vaccination workers implemented the national mandatory vaccination project, and the direct service of vaccination and administrative work was performed at a high frequency. A survey of the pilot project for expanding the coverage of national mandatory vaccinations conducted in 2005 and 2006 showed that vaccination and registration rates had improved, and the work of providing direct preventive services and vaccination registration at public health centers had decreased (Kim et al., 2009). However, this study confirmed that the duties of the health workers in charge of vaccination who provide individual vaccination services at public health centers are frequently direct services of vaccination with administrative work.

In the “administration of vaccination and management of symptoms” duty, the task with the highest determinant coefficient was managing adverse events. The frequency of this task was low; however, the determinant coefficient was high. Therefore, it was confirmed that vaccinated health workers had a high need for education on dealing with adverse reactions.

Among the task elements in the “administration of vaccination and management of symptoms” duty, dealing with an emergency in the case of an adverse event had the highest determinant coefficient, which participants recognized as more important work than actual treatment and coping methods in the case of adverse reactions to vaccination; however, they were recognized as difficult work. Particularly, managing adverse events and dealing with an emergency in the case of adverse events, such as anaphylactic reactions, are important owing to the risk of sudden death (Nikula et al., 2011). Therefore, public health workers should have the quick judgment, technology, drugs, and equipment necessary to save lives in the case of an adverse reaction and be trained. In addition, this study found that public health workers provide compensation and guidance when adverse reactions to vaccinations occur at consigned medical institutions.

The number of applications for vaccination compensation was reported to be 755 of 1327 from 1995 to 2021, with 55.1% receiving compensation (Korea Disease Control and Prevention Agency, 2022b). Owing to the COVID-19 pandemic, compensation applications for adverse events have increased since the end of 2019 (Korea Disease Control and Prevention Agency, 2022b). Compensation for damages owing to adverse reactions is a legal issue; therefore, vaccination health workers face difficulties in handling complaints. Regardless

of compensation, vaccination health workers may have difficulty dealing with their emotions because they respond to adverse cases at the forefront and fear that they may not receive legal protection (Lee, 2021). Therefore, job training that includes theoretical knowledge and skills with information on legal issues is necessary. Regarding immunization competencies for health professionals reported in Canada, the management of adverse events following vaccination is included in essential vaccination practice. The suggested training includes education on the physiology of anaphylaxis and allergic reactions, methods of reducing the risks, signs, and symptoms of the differences between anaphylaxis and fainting, treatment, reporting methods, and the recording of adverse events to vaccinations (Public Health Agency of Canada, 2008).

The duty with the third highest determinant coefficient was vaccination education. This duty encompasses the direct education of health workers in charge of vaccination at the public health center, education of people to be vaccinated, and education of related personnel who are vaccinated. Among these, the highest coefficient of determination was for the training of participants, and the task element with the highest coefficient of determination was consulting over the phone. Education for vaccinated people effectively increases vaccination rates through an increase in vaccination acceptance (World Health Organization & United Nations Children's Fund, 2021). A comprehensive approach to vaccine education requires skilled interpersonal communication from trusted sources of health information (World Health Organization & United Nations Children's Fund, 2021). Therefore, to efficiently conduct individual education, such as "consulting over the phone," which was confirmed to have the highest determinant coefficient among the task elements of the "vaccination education" duty, it is necessary to have sufficient knowledge of vaccination and include content, such as that on interpersonal communication skills. Moreover, it was recognized that job training for improving competency in the professional field, in which public health workers receive direct education and train related personnel who are vaccinated, was of high importance and not difficult.

Among the duties, the lowest determinant coefficient was for vaccination promotion. Under this duty, the determinant coefficient for the administrative management task for promotion was higher than that for the task of executing the actual promotion activity.

When the public health center vaccination worker training course is developed, it should be based on the job analysis results of this study. Furthermore, administrative education for each duty should be mandatory.

In South Korea, different types of health workers work together at public health centers (Jang et al., 2019). The job type is not determined according to a license but can be selected by the individual when taking the national exam to become a public health worker. For example, a person with a nurse's license can sit the national examination to become a public health worker and select a nursing, health, or medical technician job. The classification of job types at public health centers is based on this selection. Therefore, in this study, the job type was not classified according to an individual's license but based on the job type selected

during the national examination to work as a health worker at a public health center.

The present results confirmed significant differences in the frequency, importance, and difficulty of duties between full-time nurses and nonregular nurses in the nursing profession. Nonregular nurses in charge of vaccination work at public health centers showed a significantly higher frequency of "administration of vaccination, management of symptoms" duty, which involves direct vaccination rather than administrative work, than other health care workers.

According to the 2017 data presented by the Korean Nursing Association, 36% of nurses working in public health centers in South Korea work as nonregular nurses, making job continuity difficult owing to job instability and poor working conditions (Han & Yang, 2017). It was confirmed that nonregular nurses mainly undertake direct vaccination rather than administrative tasks, such as "vaccination promotion" and "execution of vaccination," that require responsibility and authority.

In conclusion, vaccination is essential for the effective control of infectious diseases. This study confirmed that in the context of public health centers in South Korea, the vaccination health personnel is not categorized according to a license but comprises different administrative categories, such as nurses, health workers, and medical technicians. Therefore, the public health center vaccination workers should be categorized according to license to ensure that their duties, responsibilities, and authority are clearly defined.

The job analysis revealed that the duty with the highest determinant coefficient was "execution of vaccination," the task was "implementing (carrying out) the budget," and the task element was "dealing with an emergency in the context of an adverse event." These duties, tasks, and task elements indicate that vaccination health workers have a high demand for education.

Education on duties, tasks, and task elements with high educational demands should be provided routinely without time and space limitations by combining online and offline education. In addition, for the task element of "dealing with an emergency in the case of an adverse event," various educational tools, such as problem-based learning and simulation practice, should be used.

The limitation of this study is that the job analysis for health workers from public health centers in South Korea was not performed by job type based on a license. However, this study is meaningful in that the educational needs of all public health center workers in South Korea were identified for the first time based on the determinant coefficient of job duties, tasks, and task elements. Furthermore, developing a competency-based vaccination education program that could be adapted and integrated into educational curricula would contribute significantly to professional health training programs in South Korea.

AUTHOR CONTRIBUTIONS

No-Yai Park: study conception and design, funding acquisition, data collection, editing of the manuscript, and approval of the submitted version of the manuscript. Eun-Hyun Lee, Chung-Min Cho, Young-Ran Lee, Jeong-Ik Hong, Geun-Yong Kwon, and Jeong-Mo Park: study design, data screening and analysis, data interpretation, manuscript



writing and editing, and approval of the submitted version of the manuscript.

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CONFLICT OF INTEREST STATEMENT

None declared.

DATA AVAILABILITY STATEMENT

The datasets generated and/or analyzed during the current study are not publicly available due to confidentiality agreements but are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

The institutional review board of Inje University approved this study (approval no. INJE 2019-06-013-002).

PATIENT CONSENT STATEMENT

All study participants provided informed consent.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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