

# 健康行動としての予防接種とそれに影響を与える因子の研究 －健康行動理論および公衆衛生学的見地から－

## Vaccination as Health Behavior and Factors Influence on Vaccinations in Japan － Behavior Theory and Public Health Perspectives －

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### 1. Introduction

In public health history, controlling infectious diseases and the invention of vaccinations are very important. The immunization and epidemiology development contributed to modern public health history. One of other important aspects is a development of health behavior and health behavior theories. Gochman defines health behavior as an individual's beliefs, expectations, motivations, concepts and other such factors that include preventive and adaptive behavior relating to health maintenance, restoration, and improvement (1). According to this definition, health behavior includes utilizing health services such as physician visits, vaccinations, and screenings.

Health Belief Model (HBM), Hochbaum (1958) first developed and later formulated by Becker et al. has been and is still widely used to analyze individual preventive behaviors such as immunization uptakes but have not been sufficiently examined in Japanese studies.

### 2. Objectives

In Japan the modern Preventive Immunization Law was established in 1948 where smallpox, typhoid fever, diphtheria, tetanus, and acellular pertussis (DTP) was included as immunization program (2). But since then, Japanese immunization has many issues to address concerning public health concerns such as increased risk of meningitis and deafness caused by contracting natural mumps due to decline of mumps vaccination rate among child population or increasing excess death cases as many as several thousand deaths during the flu season among which 85 to 90 percent are people 65 years old and over. The backgrounds behind these issues were examined to investigate why the mumps vaccination rate among the child population (Study I) and the seasonal influenza vaccination rate among the elderly population (Study II) are low. Questionnaires surveys were undertaken to determine what factors including HBM factors that influenced vaccination decisions targeting mothers with children (Study I) and elderly population 65 years and over (Study II) in the studies in this dissertation.

### 3. Sample and method

Study I: Factors Associated with Mothers not Vaccinating their Children against Mumps in Japan

A total of 224 mothers (44.7±5.02) with children participated. The instruments were; mumps vaccination status, demographic questions (maternal and child age, sex, number of

children, working status, those who lived with children, living abroad), social factors (residential area when vaccinated, subjective life standards) and HBM factors such as the perceived efficacy of mumps vaccination for their children, perceived severity of mumps on their children, cues to the action factors (family doctor's recommendations, knowing about vaccination subsidies, learning from experienced mothers, learning from friends, communication from governments, baby's physical examination, learning from booklets or brochures, learning from media and checking the maternity handbook), willing to pay, perceived barriers (the vaccine is not mandatory, fear of harmful side effects, being busy, offered at inconvenience in geographic location, the system is complicated, the vaccine is expensive, long waiting time at hospital and information is scarce), the maternal commitment to vaccination, who takes their children to be vaccinated. In an open-ended question, I asked the mothers to write down their opinions of vaccination.

Study II: Seasonal flu vaccination acceptance among the elderly people who live in a community in Japan

A total of 578 elderly people 65 years and over (73.19±4.43) participated. The instruments were; seasonal influenza vaccination status, reported side effects, flu-like symptoms within the past two years, demographic questions (age, working status, living with families or not), medical histories, lifestyle questions of healthy habits such as sports hours per a week, social factors (residential area, self-rated health, subjective life standards and social activities) and HBM factors such as the perceived efficacy of flu vaccination, the perceived severity of flu, the perceived vulnerability to flu and colds, cues to the action factors (family doctor's recommendations, communication from local governments, academic journals or experts' information, learning from booklets or brochures obtained at hospitals or public places, learning from the media and knowing about flu vaccine subsidies), willingness to pay, perceived barriers (the vaccine is expensive, fear of harmful side effects, being busy, the vaccination is not unnecessary, information is scarce, concern over vaccine scarcity). Two open-ended questions where participants could write freely were included; one was on their opinions about influenza vaccines and the other was about their concerns on health care, policy and the health care system.

To maximize data evaluation, the triangulation method of mixed methods was adopted in both Studies I and II. The method uses qualitative and quantitative methods together by concurrently collecting data and integrating them into one study.

As quantitative analysis of the studies in this dissertation, first descriptive analysis followed by unadjusted univariate logistic regression analysis and finally adjusted multivariate logistic regression analysis were performed for participant characteristics and HBM factors including social factors as the dependent variables of non-vaccination statuses to obtain unadjusted and adjusted odds ratios (OR). For variables not applicable for logistic regression analysis, Student's t-test or the Fisher Exact Test were undertaken according to variable characteristics. Multivariate analysis variable selection and logistic regression fitness analysis followed the theory proposed by Harrell, Moons and Hosmer (3, 4).

#### 4. Results and discussions

Study I: From quantitative multivariate analysis, mothers who thought the vaccine was ineffective (aOR=6.21;  $p<0.01$ ), who knew that the vaccination was not mandatory (aOR=3.30;  $p<0.01$ ), who feared harmful side effects (aOR=2.55;  $p=0.03$ ) and who reported being too busy to vaccinate their children (aOR=3.30;  $p=0.02$ ) were significantly less likely to have their children vaccinated. And mothers who were older (aOR=0.91;  $p<0.01$ ), living abroad when vaccination occurred or not (aOR=0.10;  $p=0.02$ ) and cue to action factors of the recommendation from the family doctor (aOR=0.35;  $p<0.01$ ) were more likely to have their children vaccinated. From qualitative analysis, many mothers had shown difficulties and mothers influenced by negative attitude of doctors were less vaccinated. In addition, not a few mothers thought mumps vaccines were not necessary because they were non-mandatory. The complicated current vaccination system and expense or lack of information of non-mandatory vaccinations had shown being barriers. Furthermore, it was suggested that the Mumps, Measles, Rubella (MMR) combination vaccine withdrawal from National Immunization Program (NIP) may have affected their awareness and fear for side effects of mumps vaccines.

Study II: From quantitative multivariate analysis, participants who were older (aOR=0.90;  $p<0.01$ ), with a history of cardiovascular diseases (aOR=0.26;  $p=0.016$ ), perceived vulnerability to the flu or colds (aOR=0.13;  $p<0.001$ ), knew about the vaccination subsidies (aOR=0.21;  $p<0.001$ ) and had the information from communication from local governments (aOR=0.12;  $p=0.024$ ) were significantly more vaccinated. Those who thought the flu vaccine ineffective (aOR=35.10;  $p<0.00$ ), with a history of rheumatism, gout or arthritis (aOR=10.90;  $p<0.018$ ), feared harmful side effects (aOR=8.74;  $p<0.001$ ) and thought the vaccine expensive (aOR=7.89;  $p=0.001$ ) were significantly less likely to have been vaccinated. Seasonal influenza vaccination is especially recommended for high-risk group with chronic diseases such as diabetes, diabetes, cardiac, renal and respiratory diseases. However, only cardiovascular disease became plus factor for vaccination in this study.

From qualitative analysis, participants in high risk group commented that information was scarce. From qualitative analysis there were participants who did not know about

subsidies even among high risk group. From quantitative analysis, perceived non-efficacy became a strong minus factor for vaccination in the study. From qualitative analysis, School Located Vaccination termination on a reason of ineffectiveness in 1987 still influenced awareness of some participants. From quantitative analysis, communication from local government became plus predictor but nearly 50% of participants relied on media as information sources. But from qualitative analysis, many participants criticize the media panic in 2009 H2N2 pandemic that had raised concern over vaccine scarcity.

#### 5. Conclusion

From both Studies I and II, HBM factors were shown to be potential effective predictors for immunizations as one preventive behavior. In addition, many issues and factors affecting immunization acceptance have been suggested, including vaccination programs, policies, facility access, costs including subsidies, disbelief in vaccines, safety, vaccine scarcity, lack of information resources, social networks, knowledge dissemination including side effects and the media.

HBM is a model at the individual level. Considering the special nature of characteristics that accompany immunization and to address the unsolved public health goals and problems presented in this paper, a more multi-level approach is necessary. More concretely, a more integrated and wider range of approaches such as an ecological model for health promotion at intra-personal levels as well as considering the natural environment, social cultural environment, information environment and especially the policy environment would be appropriate.

#### 6. Study limitation

Study I and II were cross-sectional observational studies and participants were all university graduate and their subjective life-standards were comparatively well so that generalization to common population is unknown. The problems and issues proposed in this paper such as excess mortality during influenza seasons due to insufficient immunization and mumps complications due to the spread of the disease may be worse in populations with lower socioeconomic status. Further studies focusing on social factors and social capital are necessary to research these underprivileged populations.

#### 7. Reference

1. Gochman DS. Labels, systems, and motives; some perspectives on future research. *Health Edu Q*, 1982; 9:167-174.
2. 町田和彦, 感染症ワールド「免疫力・健康・環境」(第2版) 早稲田大学出版部, 2007.
3. Harrell FE, Lee KL, Mark DB. Tutorial in biostatistics multivariable prognostic models: Issues in developing models, evaluating assumptions, and adequacy, and measuring and reducing errors. *Stat Med*, 1996 15; 361- 387.
4. Hosmer DW, Lemeshow S. *Applied Logistic Regression*, Second Edition. 2001, Wiley- Interscience, John Wiley & Sons, Inc.