# ASSESSING INFLUENZA VACCINE COVERAGE AMONG THE ELDERLY RECEIVING LONG-TERM CARE SERVICES, AND NURSES' KNOWLEDGE AND ATTITUDES TOWARDS INFLUENZA VACCINATION.

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## ABSTRACT

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CHRISTOPHER KIPKORIR: ASSESSING INFLUENZA VACCINE COVERAGE AMONG THE ELDERLY RECEIVING LONG-TERM CARE SERVICES, AND NURSES' KNOWLEDGE AND ATTITUDES TOWARDS INFLUENZA VACCINATION.
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Influenza occurs annually and has been found to be a major cause for morbidity and mortality among the elderly who are among the risk groups. The elderly residing in long-term care facilities (LTCFs) are at an even higher risk due to the confined nature of the environment and the possibility of a rapid spread in case of an outbreak. Nurses working in LTCFs often have direct contact with their patients. This puts them at greater risk of contracting influenza and also transmitting it to their patients. It is for this reason that influenza vaccination is recommended to both nurses and the elderly among other risk groups.

Unfortunately, the coverage remains low for these groups. Therefore, understanding the relationship between these two groups and the factors influencing the uptake is crucial. The aim of this study was to determine trends in influenza vaccine uptake among the elderly within the LTCFs participating in the RAI-evaluation project in Finland. Additionally, the study explored the nurses' knowledge and attitudes towards influenza vaccination by means of a survey.

Aggregate data on RAI-HC were obtained from the Finnish National Institute for Health and Welfare. The data contained information on different service types, the year, vaccination coverage, poor cognition, poor functioning in activities of daily living (ADL) as well as age (≥80). A survey on the nurses' knowledge and attitudes was also conducted among 89 nurses with different professional designations. Data were analyzed using SPSS and STATA.

There were annual variations in influenza vaccination coverage among the 3 different service types during the years 2008-2015: 62% (57-68%) in homecare, 73% (69-76%) in residential care and 65% (54-77%) in service housing. Different patient characteristics including the service types and year of data collection were associated with vaccination coverage. Among the nurses, better knowledge and attitudes were positively associated with their vaccination status, other background factors such as professional designation and gender also affected but were not statistically significant.

Even though the data used are not directly related, it supports the notion that there might be a relationship between nurses' vaccination status, knowledge and attitudes

and the coverage among the elderly. This relationship can be seen by how the nurses' vaccination status affect their ability to recommend vaccination to their patients. As this relationship is being further explored, targeted vaccination programs should be developed towards meeting the needs of both nurses and their residents within respective service types.

Based on the results, the coverage remains lower among both nurses and patients. With the knowledge that influenza vaccination still remains the most important preventive measure against influenza, focus on achieving a higher uptake among nurses and patients should be the goal. For patient safety, nurses should remember that it is their obligation and duty to get vaccinated and to advocate the same for their patients. Achieving the recommended coverage will lead to a reduction in morbidity and mortality leading to improved patient outcomes and a healthy workforce.

**Keywords:** Elderly, Vaccination, Influenza, Long-term care facility (LTCF), Homecare (HC), Resident assessment instrument for home care (RAI-HC), Nurses, Knowledge and attitudes

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**ABBREVIATIATIONS**

| | |
|---|---|
| ADL | Activities of Daily Living |
| cRCTs | cluster Randomized Controlled Trials |
| CDC | Centers for Disease Control and Prevention |
| CPS | Cognitive Performance Scale |
| ECDC | European Centre for Disease Prevention and Control |
| EEA | European Economic Area |
| EU | European Union |
| GEE | Generalized Estimating Equations |
| HC | Home Care |
| HCWs | Health Care Workers |
| LTCF | Long-Term Care Facility |
| MDS-HC | Minimum Dataset-Home care |
| NNV | Number Needed to Vaccinate |
| OR | Odds Ratio |
| SPSS | Statistical Package for the Social Sciences |
| QIC | Quasi-Likelihood Information Criteria |
| RAI | Resident Assessment Instrument |
| RAI-HC | Resident Assessment Instrument for Home Care |
| THL | Finnish National Institute for Health and Welfare |
| UK | United Kingdom |
| VCRs | Vaccine Coverage Rates |
| WHO | World Health Organization |

# 1 INTRODUCTION

Influenza is considered one of the most prevalent yet vaccine-preventable diseases (Feng et al., 2012). Vaccination is the most effective way to prevent infection and severe disease from influenza viruses (WHO, 2014). Safe and effective vaccines are available and have been in use for at least 60 years. Among the elderly, data from vaccine studies indicate that the influenza vaccine may be less effective in the prevention of disease, but other studies also indicate that it does have some effect in the alleviation of disease, severe outcomes, and even deaths. Consequently, vaccination is highly recommended to those individuals at higher risk of serious complications from influenza and even those who live with or healthcare workers (HCWs) who provide care to such individuals (WHO, 2014).

Long-term care facilities (LTCFs) are an important target for influenza vaccination. First, they provide services for the elderly, one of the risk groups for whom influenza vaccination is recommended to. Second, due to the closed nature of the environment, the potential for an influenza outbreak is high. Last, the role played by nurses working in such facilities, both as vectors and as health promoters is important, hence the need for up to date knowledge to inform decision making. Therefore, a holistic understanding of the situation is key in achieving a higher influenza vaccine coverage for both the elderly and the nurses within such facilities and should be highly encouraged. According to (Hayward, 2017) LTCFs present a possibility to showcase the proposition that vaccination of healthcare workers is important in the prevention of influenza as well as morbidity and mortality related factors among their patients.

In the transmission of influenza to patients, (Hayward, 2017) argues that vaccination of HCWs provides LTCF settings with a significant degree of resident protection. However, in their critique, (De Serres et al., 2017) argue that the proposition that unvaccinated HCWs put their patients at risk is exaggerated as HCW attributable risk and vaccine preventable fraction are not known and the number needed to vaccinate (NNV) should be well understood to establish its benefits to patients.

Knowledge of vaccination coverage as well as the factors influencing its uptake among both the elderly and the nurses is of great importance and should be well understood. This is because lower vaccination coverage has been reported among the elderly but even lower among nurses. This is despite existing recommendations and vaccination programmes (Goodband, Oakley, Rayner, Toms, & Brostoff, 2014; THL, 2016a; Vaux, Noël, Fonteneau, Guthmann, & Lévy-Bruhl, 2010). It is based on this premise that this study aimed to determine trends in influenza vaccine uptake among the elderly within the LTCFs participating in the RAI-evaluation project in Finland. Additionally, the study aimed to explore the knowledge and attitudes of nurses towards influenza vaccination in LTCFs.

Vaccination coverage monitoring is an integral part of any vaccination Programme (Derrough et al., 2016). RAI data provides a great opportunity to not only monitor vaccination coverage among those receiving long-term care services but also as a tool to guide implementation of effective vaccination programmes targeting the elderly. The nurses' role in recommending vaccination to their patients is important as well as prevention of transmission to their patients, and this should be well emphasized.

Despite the criticism by (De Serres et al., 2017), inability of the current data to provide sufficient evidence towards enforcement of HCW vaccination, they are not against voluntary vaccination or other protective measures being applied. Therefore, the ongoing debate on mandatory vaccination of HCWs should be conducted in the basis of valid and reliable evidence.

## 1.1 Background and rationale for the study

The global attack rate for any influenza infection is estimated to be 5%-10% among adults and 20%–30% in children each year, resulting in approximately 3 to 5 million severe cases of illness and 250 000 to 500 000 deaths (WHO, 2014). The highest influenza burden in developed countries in terms of deaths among those in high risk groups and of interest to this research is the elderly (≥65 years) (Vestergaard et al., 2017; WHO, 2014). In the European Union (EU) and the European Economic Area (EEA), seasonal influenza

causes 4-50 million cases with symptoms yearly and 15 000-70 000 deaths among the European citizens. Even though it lasts for a short period, yearly economic and healthcare influenza burden is substantial (ECDC, n.d.; McBean & Hebert, 2004).

Despite the evidence on the importance of vaccination among high-risk groups, the number of deaths caused by influenza continues to be a matter of public health concern. Particularly among the elderly who are the major focus of this research. Additionally, the rates among nurses who are part of health care workers (HCWs) still remain low despite the recommendations on the need to get vaccinated. Seasonality of influenza circulation varies across the world. In the northern hemisphere, including Europe, it causes epidemics yearly between November and April, while in the southern hemisphere circulation typically occurs between June and October (ECDC, n.d.).

In a study by Hayward et al., to determine the indirect benefits of influenza vaccination towards residents, they noted that the ‘‘study provides strong evidence to support influenza vaccination of care home staff even when vaccine uptake by residents is high.’’ (Hayward et al., 2006). It is based on this argument that this research seeks to explore both parties in an attempt to increase vaccine uptake in both groups and ultimately improve the health of the population involved.

In Finland, long-term care for the elderly is provided either at home, in sheltered housing, residential care homes (nursing homes) or in inpatient wards inside the health centres, also known as chronic care hospitals. Residential care homes and chronic care hospitals provide institutional care. (Finne-Soveri, H., Hammar, T., & Noro, A., 2010). The vaccination coverage in 2014-2015 among the elderly (>65 years) was estimated at 40%. This was lower than both the EU (for 2014-2015) and WHO recommended target of 75% as well as the median VCR for the year 2014-2015 (ECDC, 2015a). This is worrying as Finland provides influenza vaccination to those ≥65 years of age free of charge (THL, 2016a).

A review of literature from Finland depicts a general lack of studies on influenza coverage among the elderly and more specifically using the data obtained from resident assessment instrument (RAI). In order to adequately address the issue of low vaccination coverage rates (VCRs) among the elderly in Finland, it is important to understand the factors that influence vaccination uptake, nurse’s knowledge and attitudes being a factor.

Additionally, literature on nurses' knowledge and attitudes as well as national level vaccination coverage statistics is lacking.

## 1.2 Aims of the study

The aim of this study was to determine trends in influenza vaccine uptake among the elderly within the LTCFs participating in the RAI-evaluation project in Finland. Additionally, the study aimed to explore the knowledge and attitudes of nurses towards influenza vaccination in LTCFs.

The specific objectives were:

I. To analyze RAI-HC data collected during 2008-2015 on influenza vaccine coverage within different service types and to identify factors associated with vaccination coverage among the elderly

II. To explore by means of a survey, vaccine uptake as well as the relationship between nurse's vaccination status and personal characteristics to their knowledge and attitudes regarding influenza vaccination

# 2 LITERATURE REVIEW

## 2.1 Seasonal influenza disease burden among the elderly

The world population is inarguably ageing, other countries faster than the rest. This phenomenon presents itself with varying challenges. The population of individuals aged ≥65 years in the European Union (EU) continues to increase, it is projected that the elderly will account for 28.7% of the EU's population by 2080 from 18.5% in 2014. The trend is similar in all the EU member states, including Finland (Eurostat, 2016). According to Thompson et al. (2003) mortality attributed to influenza has greatly increased in the last two decades partly because the population is aging, this emphasizes the necessity for effective preventive measures that consists of effective vaccines as well as vaccination programs targeted at the elderly individuals (Thompson WW, Shay DK, Weintraub E,et al, 2003).

Influenza is a frequent cause of mortality among the elderly. In a study conducted between 1979 and 2007 in the US, influenza infections were found to contribute to thousands of deaths yearly, with 90% of all influenza deaths occurring among those aged ≥65 years (CDC, 2010). Similarly, according to a study conducted between 2003 and 2008 in China by Feng et al. (2012) the greatest fraction of influenza-related deaths, 69.6% and 77.8% in the northern and southern cities respectively, was among the elderly individuals aged ≥65 years (Feng et al., 2012). In Singapore, the amount of influenza related deaths was 11.3 more likely to occur among the ≥65 years as compared to the general population (Chow, Ma, Ai, & Suok, 2006). In the UK between 1999 and 2010, influenza-related deaths had a greater impact of between 2.5% to 8.1% among those aged ≥75 years per winter season (Hardelid, Pebody, & Andrews, 2013).

Among older individuals, there is further increased mortality among the very old; influenza-attributed mortality is 16 times higher among those ≥85 years, compared to those 65 to 69 years (Thompson WW, Shay DK, Weintraub E,et al, 2003). Seasonal influenza can be easily transmitted in institutional settings such as nursing homes for the elderly. (WHO, 2014). According to Goodman et al. (1982), mortality due to influenza-related outbreaks highly impact the elderly living in a confined population. Since those

residing in nursing homes are easily accessible for vaccination and related interventions, influenza prevention and control should be strongly considered in such environments. (Goodman RA, Orenstein WA, Munro TF, Smith SC,Sikes R., 1982). Additionally, the risk of influenza-related outbreaks occurs all year round. In long-term care facilities (LTCFs), outbreaks have been consistently reported including those from vaccine-matched influenza strains even with higher VCRs (WHO, 2012).

## 2.2 Influenza vaccine effectiveness and coverage among the elderly

In its council recommendation of 2009, the EU outlined guidelines that should be implemented among its member states so as to reduce the burden of seasonal influenza by promoting vaccination among the vulnerable as well as HCWs. The recommendation included a target (set by the WHO) of 75% vaccination coverage among the elderly by 2014-2015 winter season. Based on the guidelines provided by European Centre for Disease Prevention and Control (ECDC), the target of 75% would possibly be extended to include individuals with chronic conditions (EU, 2009).

Age ranges targeted by EU member states for influenza vaccination vary, and can be defined as ≥55, ≥59, ≥60, or ≥65 years of age based on countries' local policies. A study using data from either 2013-14 and/or 2014-15 influenza seasons was conducted on seasonal influenza VCRs among 24 member states, including Finland. According to the report, in 2014-15, VCRs varied from 1.1% to 76.3% with a median of 45.5%. United Kingdom (UK) reported the highest VCRs with its countries achieving or nearly achieving the EU target of 75%. In Finland, data from 2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014 and 2014-2015 data shows vaccination coverage of approximately 51%, 45%, 40%, 39%, 34%, 42% and 40% respectively among those ≥65 years of age. All these have been below the 2014-2015 EU target of 75% and the median VCR for 2014-15 (apart from the year 2008-2009). (ECDC, 2015a; ECDC, 2015b; ECDC, 2016).

Currently available influenza vaccines are considered to be effective (Nichol, Nordin, Nelson, Mullooly, & Hak, 2007) as well as cost effective in the elderly population (Deans,

Stiver, & McElhaney, 2010; Maciosek, Solberg, Coffield, Edwards, & Goodman, 2006). In case of an antigenic match between the vaccine and the circulating virus, trivalent inactivated influenza virus vaccine has been found to protect approximately 70%-90% of healthy adults against laboratory confirmed influenza sickness (Grohskopf, Sokolow, & Broder, 2016; Jefferson et al., 2010). However, the situation remains uncertain in regards to the elderly (Lang et al., 2012).

A randomized double-blind placebo-controlled trial was conducted by (Govaert et al., 1994) in the Netherlands during the influenza season from 1991-1992 to study the efficacy of influenza vaccination among elderly individuals. It was established that there was 57% influenza vaccine effectiveness among those aged between 60 and 69 years and only 23% among those above 70 years. This shows that vaccine effectiveness seems to decrease with increasing age. (Lang et al., 2012) considered this as one of the largest and well-designed study. Uncertainty due to possible side effects and vaccine effectiveness is considered as the likely reason for low vaccine uptake among the elderly (Th. M. E. Govaert et al., 1993).

In the case of low influenza vaccine effectiveness among the elderly who are at a higher risk for severe complications, an urgent need for accurate and timely diagnosis is necessary (Lam et al., 2016). Timely antiviral treatment is recommended and has been considered beneficial for those hospitalized with either confirmed or suspected influenza (Lindegren et al., 2015). However, ‘‘Laboratory testing with polymerase chain reaction (PCR) is not always available, and most other tests are of relatively low sensitivity and/or may not yield results in a timely manner’’ (Lam et al., 2016).

## 2.3 Knowledge and attitudes of nurses towards influenza vaccination

As part of HCWs, nurses are considered to be the largest group and that are most often in direct contact with the patients (McEwen & Farren, 2005). As such, nurses play an important role in giving advice and information to patients on the safety and effectiveness of influenza vaccine (Leask et al., 2008). Bearing this in mind, the need to understand nurses’ knowledge and attitudes towards influenza vaccination is important. In the United Kingdom (UK) for example, a Programme on influenza vaccination of HCWs in the front

line is considered important in curbing the effect of seasonal outbreaks (Goodband et al., 2014).

Nurses are among the HCW group for whom annual vaccination is recommended (ECDC, 2015a; WHO, 2014). The vaccine recommendation is aimed at safeguarding the health of vulnerable individuals as well as minimizing transmission (ECDC, 2015a). Vaccination helps to protect patients in high-risk groups such as the elderly, which is the target of this research thus avoiding complications that includes mortality caused by influenza infection (Goodband et al., 2014).

Due to their contact with patients or infective materials from them, nurses bear the risk of being exposed to or possibly spreading influenza. As such, maintenance of influenza vaccination coverage should be made an integral part of prevention and infection control programmes for nurses and HCWs in general. The vaccination rates among nurses are still below the required standard despite the fact that vaccination campaigns have raised vaccination coverage among HCWs in certain local facilities (Zhang, While, & Norman, 2010).

According to (Smith, Sim, & Halcomb, 2016), insufficient research is available on nurses' knowledge, attitudes and practices regarding influenza vaccination as only 10 papers met their inclusion criteria. In their integrated review on the topic, the authors identified five important themes namely; the relationship between knowledge and influenza vaccination, perception of risk, motivators for influenza vaccination and barriers to influenza vaccination (Smith et al., 2016). They are discussed below.

### 2.3.1 The relationship between knowledge and influenza vaccination

According to a study by (Zhang, While, & Norman, 2011), they found out that nurses with a higher level of knowledge had a significantly increased likelihood of being vaccinated in the last year as compared to those with low knowledge. Furthermore, those who were vaccinated were found to have been more likely to have agreed with the statements that, ‘‘the most effective way to prevent influenza and its complications is vaccination’’, ‘‘Nursing-home residents are one of the groups at highest risk of

complications of seasonal influenza'' and ''Elderly individuals living at home are one of the groups at highest risk of complications of seasonal influenza'' (Zhang et al., 2011).

On the contrary, lack of knowledge with respect to influenza and vaccination programs was associated with vaccination uptake (Smith et al., 2016). Those who were not vaccinated were more likely to agree with the statements that ''vaccinations give some people influenza'', ''seasonal influenza vaccines are unsafe'' and that ''vaccination may have serious adverse effects'' (Zhang et al., 2011). This results have been echoed by (Johansen, Stenvig, & Wey, 2012) who found out that 48% of the unvaccinated cited that influenza vaccine can give the recipient influenza while 2.6% strongly agreed with the statement that vaccine can cause illness. Additionally, (Seale et al., 2010) established that 43% of the nurses agreed with the statement that ''the flu vaccine can cause the flu in some people''.

### 2.3.2 Influenza risk perception

(Smith et al., 2016) reported that a number of studies have found that the risk of influenza is perceived differently between vaccinated and unvaccinated nurses. Among the respondents, those with a high-risk perception were more likely to have been vaccinated within the last one year than those with low-risk perception (Clark, Cowan, & Wortley, 2009; O'Reilly, Cran, & Stevens, 2005; Shahrabani, Benzion, & Yom Din, 2009; Zhang et al., 2011). Additionally, (Shahrabani et al., 2009) found that in comparison to unvaccinated nurses, those vaccinated perceive influenza as a more serious illness as well as perceive more benefits due to vaccination. In their study, (Zhang et al., 2011) found that those with high level of knowledge perceived highly the level of risk.

### 2.3.3 Motivating factors for influenza vaccination

In their integrated review, (Smith et al., 2016) found that respondents in studies conducted by (Clark et al., 2009; Johansen et al., 2012; O'Reilly et al., 2005; Zhang et al., 2010) accepted to be vaccinated due to self-protection from illness. In addition, the other reason given for receipt of influenza vaccination was protection of patients (Johansen et al., 2012; McEwen & Farren, 2005; O'Reilly et al., 2005; Seale et al., 2010; Zhang et al., 2010).

According to (Johansen et al., 2012; Norton, Scheifele, Bettinger, & West, 2008; O'Reilly et al., 2005; Zhang et al., 2010) habit is a motivational factor to getting vaccinated. This is supported by their findings that those who had been previously vaccinated, were more likely to be vaccinated again in future. Of great importance and relevance to this research is a finding by (Zhang et al., 2010) that being vaccinated was a strong predictor to recommending the vaccination to patients.

### 2.3.4 Influenza vaccination barriers

Most healthcare workers, nurses included decline to be vaccinated due to safety issues and the concern due to adverse effects (Nair, Holmes, Rudan, & Car, 2012). This corroborates the information given by (Clark et al., 2009; Johansen et al., 2012; McEwen & Farren, 2005; Norton et al., 2008; O'Reilly et al., 2005; Zhang et al., 2010).

The belief of self-immunity is also considered as a barrier to influenza vaccination (Johansen et al., 2012; McEwen & Farren, 2005; Norton et al., 2008; O'Reilly et al., 2005; Zhang et al., 2010). Strikingly, there is a significant difference in perception of barriers towards influenza vaccination among vaccinated and unvaccinated nurses (Shahrabani et al., 2009).

As stated above, the fear of adverse events is a typical threat to vaccination. However, reported adverse events or side-effects were found to be less frequent and not dangerous (Clark et al., 2009; Fernandez et al., 2009; Johansen et al., 2012; McEwen & Farren, 2005; Norton et al., 2008). Arm soreness was found to be most frequently reported post vaccine symptom (McEwen & Farren, 2005; Norton et al., 2008) with body aches, fever, sore throat and cough in that order (McEwen & Farren, 2005).

## 2.4 The relationship between vaccination of healthcare workers and reduction of influenza related outcomes among the elderly

The need to pursue this relationship is informed by the fact that nurses' knowledge and attitudes influences both the nurses' decision to get vaccinated and to recommend the vaccination to their patients. Achieving maximum results will therefore mean that,

influenza vaccine promotional programs are targeted at the nurses and this will eventually lead to improved patient outcomes.

It is important to take an approach that addresses influenza vaccine coverage among patients and nurses. This is because it has been found that, patients are at risk of influenza during outbreaks despite high vaccination coverage. Finland and many other countries recommend influenza vaccine to healthcare workers yearly. It has been established that ‘‘vaccination of healthcare workers can reduce serologically confirmed influenza by nearly 90% in those vaccinated.’’ As a result, the immune staff may not infect their patients. In their study, Hayward et al. sought ‘‘to determine whether vaccination of care home staff against influenza indirectly protects residents.’’ They found out that vaccination of care home staff against influenza may lead to prevention of deaths, morbidity and related health service use among residents during moderate influenza activity seasons (Hayward et al., 2006)

A study by Carman found in their study that their vaccination program of the healthcare workers was associated with a reduction in mortality among patients. (Carman et al., 2000; Potter et al., 1997). This evidence is corroborated by a study conducted by Potter in which a 7% (17% to 10%) reduction was recorded among the elderly long-term care patients as a result of vaccinating healthcare workers (Potter et al., 1997).

Four cluster randomized controlled trials (cRCTs) (Carman et al., 2000; Hayward et al., 2006; Lemaitre, 2009; Potter et al., 1997) conducted in LTCFs and some of which have been analyzed here, established that vaccination of HCWs resulted in reduced patient risk. However, in their critical analysis of these articles, (De Serres et al., 2017) they evaluate the ‘‘plausibility of cRCT conclusions by assessing consistency with the natural boundaries for indirect vaccine effects set by the mathematical principle of dilution, taking into account involved compound probabilities’’. They further argue that ‘‘whereas it is assumed on the basis of these studies that unvaccinated HCWs place their patients at great influenza peril, we show through detailed critique and numerical recalibration that these impressions are exaggerated’’.

In response to the above argument by (De Serres et al., 2017), (Hayward, 2017) says ‘‘we think the effect is likely to be substantially greater in long-term care facilities for frail elderly residents than in the acute care setting or in long term care facilities catering for less frail patients’’.

# 3 METHODS

## 3.1 Data from Resident Assessment Instrument for Home Care

The interRAI Home Care Assessment system (HC) is an assessment system ‘‘that informs and guides comprehensive care and service planning in community-based settings around the world’’. It is used to assess the status of frail elderly persons who use formal health care and supportive services (interRai, n.d.a). The study utilized data from RAI-HC. The component on influenza vaccination asked whether an individual had received the vaccination within the last two years

In Finland, RAI-HC is conducted twice a year via regularly scheduled assessments to assess nutrition, medication, wounds, physical function, cognitive function, pain, safety/environment and other (THL, 2014). Organizations decide voluntarily whether or not to participate in the project and the nurses are responsible in data collection through client interviews (Pärn, Mäkelä, & Lyytikäinen, 2016). Despite being voluntary, organizations joining the quality development network are expected to conduct regular assessments of their residents (Rummukainen, Mäkelä, Noro, Finne-Soveri, & Lyytikäinen, 2013).

Aggregate data was used and provides information at the facility (service type) level. The data contained information on clients/patients above the age of 80, the year of data collection (2008-2015), service types (homecare, residential care and service housing), vaccination coverage as well as different patient characteristics namely; poor cognition and poor activities of daily living (ADL) functioning. It is important to note that while some settings provided data for all the years (2008-2015) others did not. This issue is addressed during data analysis.

Status and outcome measurement scales assessed consisted of activities of daily living (ADL) hierarchy scale and cognitive performance scale (CPS). The ADL hierarchy scale classifies ADLs based on its level of occurrence in the disablement process. The items used in the scale are; personal hygiene, toilet use, locomotion and eating, on a scale of 0 (independence) to 6 (total dependence). CPS provides a combination of information on

memory impairment, level of consciousness as well as executive function. The scores ranges from 0 (intact) to 6 (very severe impairment). (interRai, n.d.).

The unit of analysis was service type. Data were analyzed to obtain descriptive statistics. Continuous variables are presented as mean values ± standard deviation. Graphs were created using excel. To identify the factors associated with vaccination coverage, a generalized estimating equations (GEE) analysis (logit link) was conducted with influenza vaccination coverage as the main outcome, with the covariates being; service type, year, age, poor cognition and poor ADL functioning as shown in tables 4 and 5. The Quasi-likelihood information criteria (QIC) value was used to select the best correlation structure as well as the best fitting model in GEE. Both univariate and multivariate models are presented. The analysis was performed using SPSS 24.0.0.1 and STATA 14.2 (multivariate model) software.

## 3.2 Survey on the knowledge and attitudes of nurses towards influenza vaccination

A survey on the knowledge and attitudes of nurses towards influenza vaccination among nurses was conducted on a RAI seminar held in Kouvola, Finland on 19th May 2016. A self-administered questionnaire was used to assess the nurse' knowledge and attitudes towards influenza. The questions adapted from previously conducted surveys (Bonaccorsi et al., 2015; Marentette, 2011; Seale, Leask, & MacIntyre, 2010) were adapted for the purposes of this particular study. The questionnaire was divided into 3 sections, section A consisted of the participant's basic information while section B part was on vaccination history and the last section C addressed knowledge and attitude questions.

The questions were written in English (Appendix 1/2) and then translated to Finnish language (Appendix 1/1). The questionnaires were sent to the nurses who attended the seminar by email. The use of self-administered questionnaires as a means of data collection is increasingly becoming a norm due to improved access to the internet. Additionally, sufficient evidence has shown that self-administered methods especially computer based are better suited in obtaining data on sensitive issues as compared to conducting interviews (Fowler, 2009).

The knowledge and attitudes scores was based on 9 items scored as 1 for the correct answer and 0 for the wrong answer. Scores were evaluated based on whether or not it was above the median score. Further information on the scoring can be seen in table 1. Statistical analysis was performed using SPSS software. Either chi-square or the fisher's exact test was used to assess the association between categorical variables under study. Mann-Whitney U test (two groups) and Kruskal-Wallis test (> two groups) was run to determine if there were differences in the scores (continuous variable) between different characteristics groups.

**Table 1. Scores used in the evaluation of knowledge and attitudes questions**

| **Questions** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **Correct Responses** | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | |
| **Scores** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |

### 3.3 Ethical aspects

The RAI-HC research data obtained from THL is covered by approval from the ethical committee of THL. This refers to an umbrella research approval, valid between 2012 and 2025, and this follows the data handling procedures provided by it. The author has already signed a data confidentiality agreement from the National Institute for Health and Welfare of Finland (THL). The agreement was signed before the provision of preliminary aggregate data in the hope of familiarizing with the data during the research plan development.

Ethical considerations in survey is just as important as in any research involving the participation of human subjects. As a researcher, the most fundamental principle in carrying out a survey is ensuring that participants are not harmed. Respondents ought to be well informed about their involvement in the survey. (Fowler, 2009). Accordingly, a cover letter with information explaining the purpose of the research as well as assurance about the protection of anonymity of responses was sent alongside all the questionnaires. Response to the questionnaires was considered as a consent.

# 4 RESULTS

## 4.1 RAI-HC data on influenza vaccination coverage in LTCFs

The annual number of unit observations by service type during 2008-2015 are presented in Table 2 below. The highest number of unit observations 3234 were made in homecare while the lowest number 336 was in service housing. The number of unit observations assessed increased from 2008 to 2015 and were 325 to 647 respectively.

**Table 2. Annual number of unit observations by service type/unit, 2008-2015**

| Year / Service type | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | Total (unit observations) |
|---|---|---|---|---|---|---|---|---|---|
| Home care | 256 | 339 | 353 | 383 | 442 | 469 | 480 | 512 | 3234 |
| Residential care | 41 | 43 | 54 | 63 | 69 | 73 | 75 | 85 | 503 |
| Service housing | 28 | 32 | 37 | 41 | 56 | 49 | 43 | 50 | 336 |
| Total | 325 | 414 | 444 | 487 | 567 | 591 | 598 | 647 | 4073 |

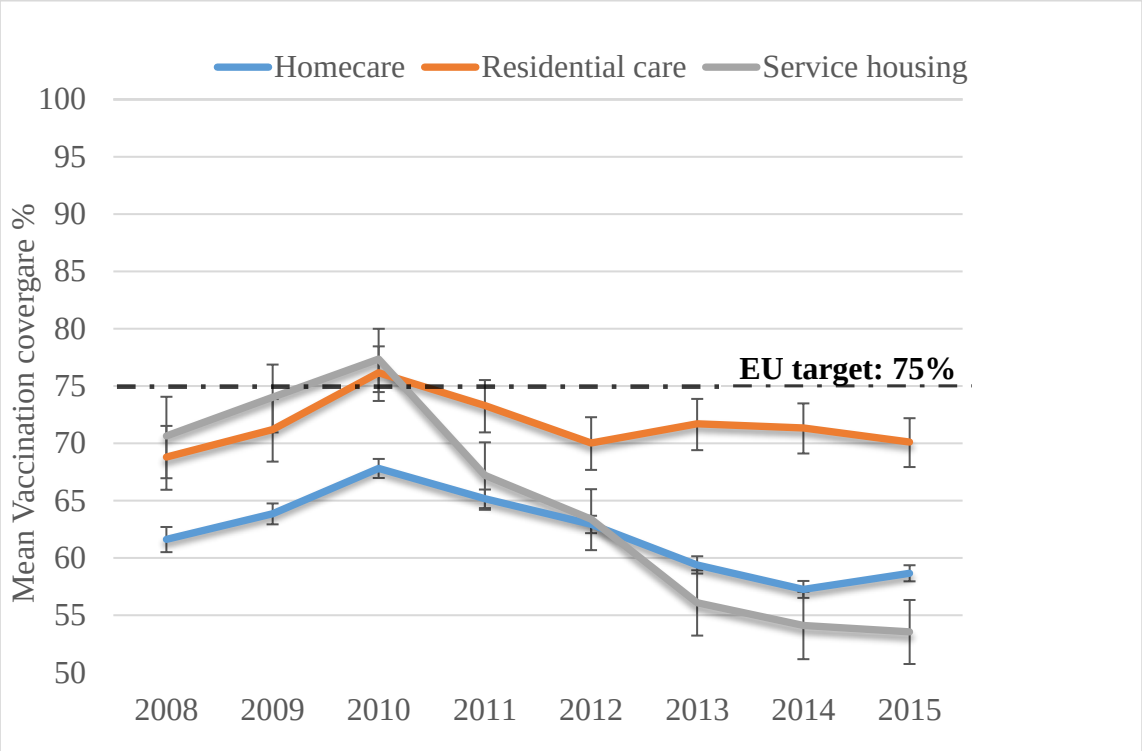
Table 3 below shows different clients/patient characteristics as well as influenza vaccine coverage in accordance with the three different units studied. Residential care units consistently recorded higher values in all the variables followed by service housing and lastly, homecare units as can be seen in the table. Overall vaccination coverage during 2008-2015 was 62% (57-68%) in homecare, 73% (69-76%) in residential care and 65% (54-77%) in service housing.

**Table 3. Vaccination coverage and patient characteristics by type of settings/units, 2008-2015**

| **Coverage and patient characteristics** | **Homecare** n=3234 | **Residential care** n=503 | **Service housing** n=336 |
|---|---|---|---|
| Coverage: % vaccinated, mean (sd) | 62.0 (15.6) | 72.5 (17.5) | 65.4 (22.2) |
| Poor cognition %, mean (sd) | 14.8 (9.6) | 43.6 (26.0) | 23.2 (17.4) |
| Poor ADL-function %, mean (sd) | 12.0 (8.1) | 46.8 (22.3) | 22.0 (18.0) |
| Age ≥80 years %, mean (sd) | 63.1 (14.2) | 69.6 (13.8) | 64.2 (18.7) |

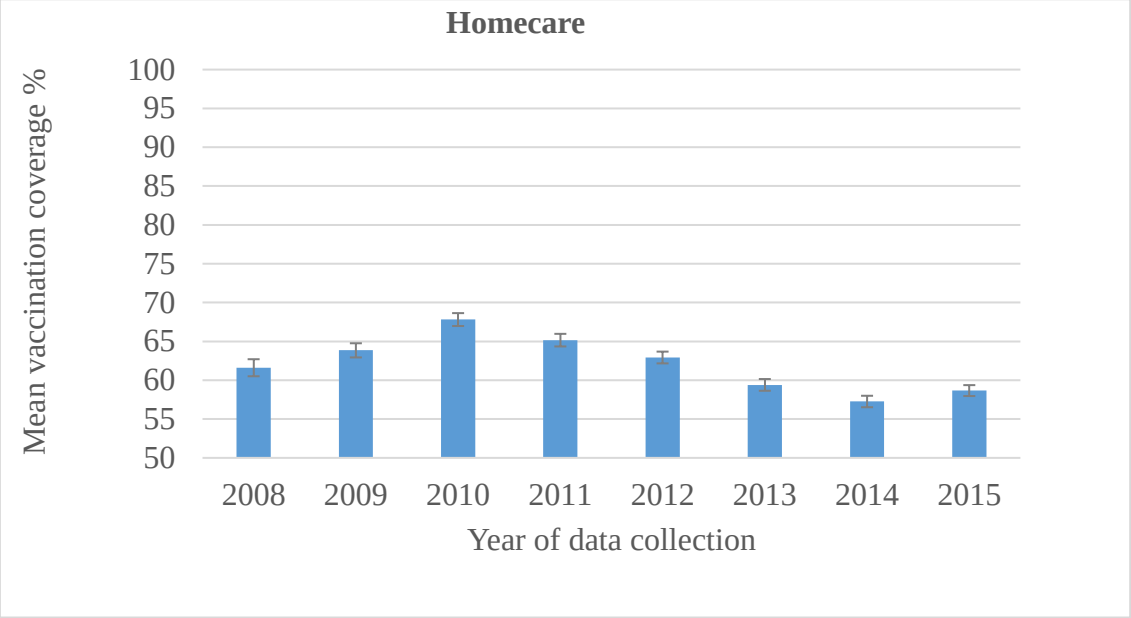
Figure 1 below shows the mean annual vaccination coverage rates within three service types during 2008-2015. Notably, there was a general increase in coverage for all the service types from 2008-2010 after which the trend changed, mostly declining. Strikingly, service housing recorded a sharp decrease after 2010-2015. The year 2010 was exceptional for all the service types as it recorded the highest coverage as compared to all the other years. Homecare had the lowest coverage in almost all the years apart from during 2013-2015, where it was higher than in service housing but still consistently lower than residential care. Residential care consistently recorded higher coverage apart from the year 2010 where a slightly lower coverage than service housing was recorded. The error bars represent standard deviation.

**Figure 1. Influenza vaccination coverage by type of setting/units from 2008-2015**



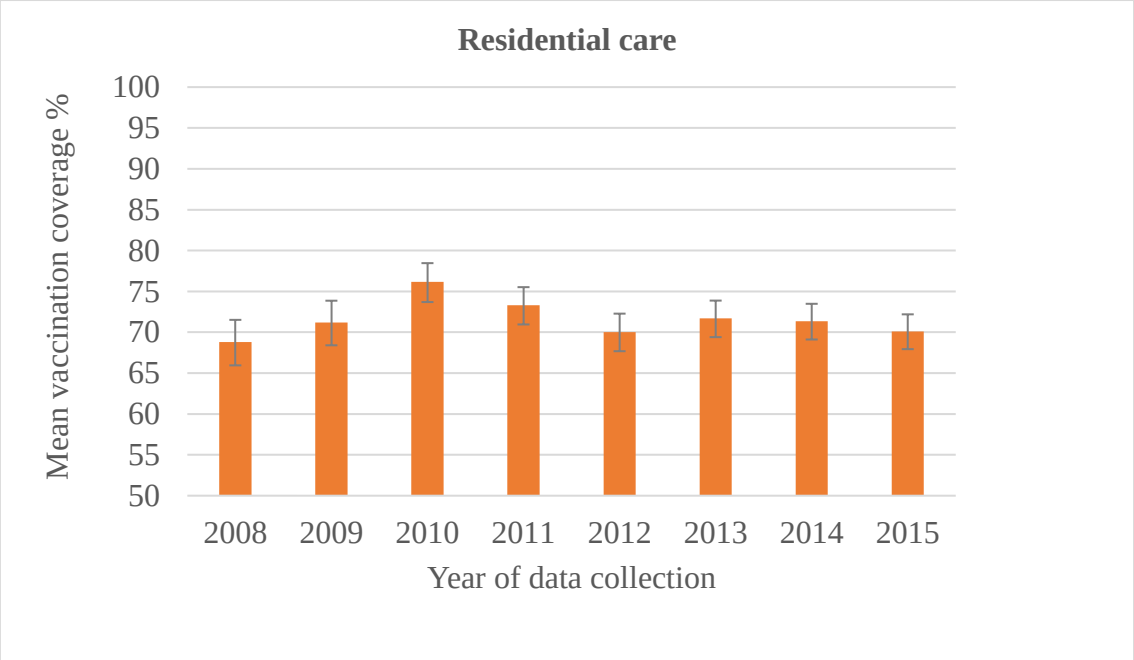

Figures 2, 3 and 4 below show respective annual coverage rates for homecare, residential care and service housing during 2008-2015. Additionally, both minimum and maximum coverage rates are shown based on each service type.

**Figure 2. Influenza vaccination coverage for homecare from 2008-2015**



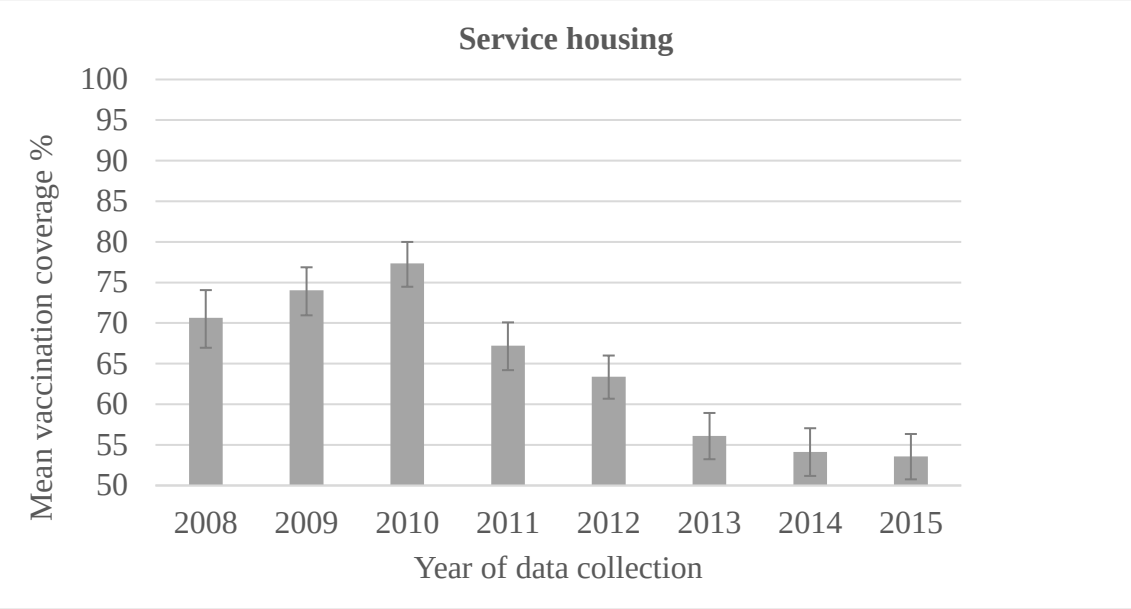

Coverage %: Minimum- 57.3 (2014) Maximum- 67.8 (2010)

**Figure 3. Influenza vaccination coverage for residential care from 2008-2015**




Coverage %: Minimum- 68.8 (2008) Maximum- 76.2 (2010)

**Figure 4. Influenza vaccination coverage for service housing from 2008-2015**




Coverage %: Minimum- 53.6 (2015) Maximum- 77.4 (2010)

In Table 4 below, different factors studied have been analyzed according to the three service types using a univariate GEE model. Vaccination coverage has been used as a dependent variable. Overall, living in a residential care was associated with a higher vaccine coverage (OR 1.57, 95% CI 1.38-1.78 and $p<0.001$), with homecare as the reference category. Almost all ORs (>1) in residential care had insignificant p-values as compared to both home care and service housing.

**Table 4. Factors associated with vaccination coverage, Univariate model**

| Service type | Variables | OR | 95 % CIs | P-value |
|---|---|---|---|---|
| **Homecare** | **Year**: 2015 | 0.88 | 0.80–0.98 | 0.022 |
| | 2014 | 0.84 | 0.75–0.93 | 0.001 |
| | 2013 | 0.91 | 0.82–1.01 | 0.076 |
| | 2012 | 1.06 | 0.96–1.17 | 0.266 |
| | 2011 | 1.17 | 1.06–1.28 | 0.002 |
| | 2010 | 1.31 | 1.19–1.45 | 0.000 |
| | 2009 | 1.10 | 1.01–1.20 | 0.025 |
| | **Ref**:2008 | 1 | . | . |
| | Poor cognition | 1.01 | 1.00–1.01 | 0.002 |
| | Poor ADL function | 1.00 | 0.99–1.01 | 0.315 |
| | Age ≥80 years | 1.00 | 0.99–1.00 | 0.832 |
| | Homecare **(Ref)** | 1 | . | . |
| **Residential care** | **Year**: 2015 | 1.06 | 0.85–1.33 | 0.587 |
| | 2014 | 1.13 | 0.91–1.41 | 0.281 |
| | 2013 | 1.15 | 0.90–1.46 | 0.263 |
| | 2012 | 1.06 | 0.82–1.37 | 0.659 |
| | 2011 | 1.25 | 0.97–1.60 | 0.088 |
| | 2010 | 1.45 | 1.06–1.97 | 0.019 |
| | 2009 | 1.12 | 0.90–1.39 | 0.297 |
| | **Ref**:2008 | 1 | . | . |
| | Poor cognition | 1.01 | 1.00–1.01 | 0.003 |
| | Poor ADL function | 1.00 | 0.99–1.01 | 0.514 |
| | Age ≥80 years | 1.01 | 1.00–1.02 | 0.020 |
| | Residential care (**Ref: Homecare**) | 1.57 | 1.38–1.78 | <0.001 |
| **Service housing** | **Year**: 2015 | 0.48 | 0.32–0.73 | <0.001 |
| | 2014 | 0.49 | 0.32–0.75 | 0.001 |
| | 2013 | 0.53 | 0.37–0.76 | 0.001 |
| | 2012 | 0.72 | 0.50–1.04 | 0.082 |
| | 2011 | 0.85 | 0.58–1.25 | 0.410 |
| | 2010 | 1.42 | 0.99–2.04 | 0.057 |
| | 2009 | 1.19 | 0.89–1.58 | 0.247 |
| | **Ref**:2008 | 1 | . | . |
| | Poor cognition | 0.99 | 0.98–1.01 | 0.449 |
| | Poor ADL function | 0.99 | 0.98–1.00 | 0.051 |
| | Age ≥80 years | 0.99 | 0.99–1.00 | 0.178 |
| | Service housing **(Ref: Homecare**) | 1.07 | 0.86–1.34 | 0.525 |

[1]

[1] Each of the variables in the table were analyzed individually

[2]Table 5 below shows results from a multivariate model with service type, year, poor cognition and age as covariates. Notably, as compared to the results in the univariate model, service housing was highly associated with the vaccination coverage (OR 1.45, CI 1.08–1.96 and p-value= 0.013). ORs for the years 2009-2015 were similar with those in the univariate model.

**Table 5. Factors associated with vaccination coverage, Multivariate model**

| Service type | Variables | OR | 95 % CIs | P-value |
|---|---|---|---|---|
| **Homecare** | **Year**: 2015 | 0.88 | 0.79–0.98 | 0.018 |
| | 2014 | 0.83 | 0.75–0.92 | <0.001 |
| | 2013 | 0.91 | 0.82–1.01 | 0.069 |
| | 2012 | 1.06 | 0.96–1.17 | 0.272 |
| | 2011 | 1.16 | 1.06–1.28 | 0.002 |
| | 2010 | 1.31 | 1.17–1.44 | <0.001 |
| | 2009 | 1.09 | 1.01–1.19 | 0.036 |
| | Ref:2008 | 1 | . | . |
| | Homecare **(Ref)** | 1 | . | . |
| **Residential care** | **Year**: 2015 | 0.98 | 0.78–1.23 | 0.881 |
| | 2014 | 1.08 | 0.86–1.35 | 0.526 |
| | 2013 | 1.10 | 0.86–1.41 | 0.438 |
| | 2012 | 1.01 | 0.77–1.31 | 0.960 |
| | 2011 | 1.19 | 0.92–1.53 | 0.180 |
| | 2010 | 1.41 | 1.04–1.92 | 0.029 |
| | 2009 | 1.10 | 0.89–1.37 | 0.388 |
| | Homecare Ref:2008 | 1 | . | . |
| | Residential care (**Ref: Homecare**) | 1.27 | 1.07–1.52 | 0.008 |
| **Service housing** | **Year**: 2015 | 0.47 | 0.31–0.71 | <0.001 |
| | 2014 | 0.48 | 0.31–0.73 | 0.001 |
| | 2013 | 0.52 | 0.36–0.74 | <0.001 |
| | 2012 | 0.70 | 0.49–1.01 | 0.059 |
| | 2011 | 0.83 | 0.57–1.22 | 0.342 |
| | 2010 | 1.41 | 0.99–2.00 | 0.058 |
| | 2009 | 1.17 | 0.88–1. 54 | 0.283 |
| | Homecare Ref:2008 | 1 | . | . |
| | Service housing **(Ref: Homecare**) | 1.45 | 1.08–1.96 | 0.013 |
| Poor cognition | | 1.00 | 0.99–1.00 | 0.512 |
| Age ≥80 years | | 1.00 | 1.00–1.01 | 0.002 |

[2] All variables shown in the table have been controlled for in the model.

## 4.2 Survey on the knowledge and attitudes of nurses towards influenza vaccination

Table 6 below shows the basic characteristics of nurses who took part in the survey. The median age and working experience was 43 and 17 years respectively. Majority of nurses who responded to the survey had been vaccinated (76%), were female (95.5%), and worked on a full-time basis (96.6%), with the highest percentage being registered nurses (44.7%). Most of the nurses reported to be working in sheltered housing (43.2%).

**Table 6. Nurses' characteristics and vaccination status according to the survey, n=89.**

| **Nurses' characteristics and vaccination status** | **Description** | | |
|---|---|---|---|
| Median Age (years), Min. - Max. | 42, 22–63 | | |
| Median working experience (years), Min. -Max. | 15, 2–45 | | |
| | | **n** | **(%)** |
| Gender | Female | 85/89 | (95.5) |
| Professional designation | Practical nurse | 35/85 | (41.2) |
| | Registered nurse | 38/85 | (44.7) |
| | Public health nurse | 12/85 | (14.1) |
| Type of organization | Home nursing | 23/88 | (26.1) |
| | Sheltered housing | 38/88 | (43.2) |
| | Residential care | 10/88 | (11.4) |
| | Health center ward | 2/88 | (2.3) |
| | Other | 15/88 | (17.0) |
| Working relationship | Full-time | 86/89 | (96.6) |
| Vaccination status | Yes | 67/88 | (76.1) |
| Vaccination status in the last flu season | Yes | 39/75 | (52.0) |

Table 7 below shows how different nurses' characteristics relates with being vaccinated. Overall, the highest vaccination rate was reported among those above the age of 40 (78.8%), those with more than 20 years working experience (83.9%), females (77.4%) and those working part-time. Vaccination coverage among the nurses varied according to professional designation, with practical nurses being the lowest at 71.4% and the public health nurses being the highest at 83.3%. The coverage also differed depending on the type of organization one was employed in. However, none of the differences were statistically significant.

**Table 7. Vaccination status by nurses' characteristics**

| Variable descriptions | | Vaccinated n (%) | P-value |
|---|---|---|---|
| **Age groups n=88** | <39 years | 26/36 (72.2) | 0.612 |
| | >40 years | 41/52 (78.8) | |
| **Gender n=88** | Female | 65/84 (77.4) | 0.240 |
| | Male | 2/4 (50.0) | |
| **Working experience n=86** | <19 years | 41/55 (74.5) | 0.420 |
| | >20 years | 26/31 (83.9) | |
| **Employment status n=88** | Full-time | 64/85 (75.3) | 1.000 |
| | Part-time | 3/3 (100.0) | |
| **Professional designation n=84** | Practical nurse | 25/35 (71.4) | 0.708 |
| | Registered nurse | 28/37 (75.7) | |
| | Public health nurse | 10/12 (83.3) | |
| **Type of organization n=87** | Home nursing | 16/23 (69.6) | 0.421 |
| | Sheltered housing | 28/37 (75.7) | |
| | Residential care | 8/10 (80.0) | |
| | Health centre ward | 1/2 (50.0) | |
| | Other | 14/15 (93.3) | |

Table 8 below shows how vaccinated and unvaccinated nurses responded to the different knowledge and attitudes questions. Three of the response items; ‘‘Influenza vaccine prevents against seasonal influenza’’, ‘‘Influenza vaccine provides self-protection’’ and ‘‘I would recommend influenza vaccination to the elderly in my work place’’ were statistically significantly associated with their vaccination status.

**Table 8. Knowledge and attitudes by vaccination status**

| Response addressing questions on knowledge and attitudes | | Vaccinated n=67 | Unvaccinated n=21 | P-value |
|---|---|---|---|---|
| **1. Influenza vaccine prevents against seasonal influenza** | Yes | 39 (86.7) | 6 (13.3) | 0.031 |
| | No | 6 (54.5) | 5 (45.5) | |
| | Maybe | 20 (66.7) | 10 (33.3) | |
| **2. Influenza vaccine reduces transmission risk** | Yes | 52 (81.3) | 12 (18.8) | 0.126 |
| | No | 2 (50.0) | 2 (50.0) | |
| | Maybe | 12 (63.2) | 7 (36.8) | |
| **3. Influenza vaccine provides self-protection** | Yes | 40 (88.9) | 5 (11.1) | 0.008 |
| | No | 5 (50.0) | 5 (50.0) | |
| | Maybe | 21 (65.6) | 11 (34.4) | |
| **4. Influenza vaccine is safe** | Yes | 38 (82.6) | 8 (17.4) | 0.290 |
| | No | 3 (60.0) | 2 (40.0) | |
| | Maybe | 26 (70.3) | 11 (29.7) | |
| **5. Influenza vaccination is an important preventive measure for the elderly** | Yes | 61 (81.3) | 14 (18.7) | 0.057 |
| | No | 1 (50.0) | 1 (50.0) | |
| | Maybe | 5 (50.0) | 5 (50.0) | |
| **6. Being healthy protects against seasonal influenza** | Yes | 38 (71.7) | 15 (28.3) | 0.220 |
| | No | 14 (93.3) | 1 (6.7) | |
| | Maybe | 15 (75.0) | 5 (25.0) | |
| **7. Influenza vaccination may cause side effects** | Yes | 39 (73.6) | 14 (26.4) | 0.624 |
| | No | 2 (100.0) | - | |
| | Maybe | 26 (78.8) | 7 (21.2) | |
| **8. Influenza is a serious illness for the elderly** | Yes | 66 (77.6) | 19 (22.4) | 0.140 |
| | No | - | - | |
| | Maybe | 1 (33.3) | 2 (66.7) | |
| **9. I would recommend influenza vaccination to the elderly in my work place** | Yes | 55 (83.3) | 11 (16.7) | 0.023 |
| | No | 11 (55.0) | 94 (45.0) | |
| | Maybe | 1 (50.0) | 1 (50.0) | |

Table 9 below shows how vaccinated and unvaccinated nurses responded to the different knowledge and attitudes questions with the ‘‘no and maybe’’ combined together. As compared to table 8 above, most of the responses; ‘‘Influenza vaccine prevents against seasonal influenza’’, ‘‘Influenza vaccine reduces transmission risk’’, ‘‘Influenza vaccine provides self-protection’’, ‘‘Influenza vaccination is an important preventive measure for the elderly’’ and ‘‘I would recommend influenza vaccination to the elderly in my work place’’ were statistically significantly associated with their vaccination status.

**Table 9. Knowledge and attitudes by vaccination status (No and Maybe responses combined)**

| **Response addressing questions on knowledge and attitudes** | | **Vaccinated n=67** | **Unvaccinated n=21** | **P-value** |
|---|---|---|---|---|
| **1. Influenza vaccine prevents against seasonal influenza** | Yes | 39 (86.7) | 6 (13.3) | 0.012 |
| | No/Maybe | 26 (63.4) | 15 (36.6) | |
| **2. Influenza vaccine reduces transmission risk** | Yes | 52 (81.3) | 12 (18.8) | 0.050 |
| | No/Maybe | 14 (60.9) | 9 (39.1) | |
| **3. Influenza vaccine provides self-protection** | Yes | 40 (88.9) | 5 (11.1) | 0.003 |
| | No/Maybe | 26 (61.9) | 16 (38.1) | |
| **4. Influenza vaccination is an important preventive measure for the elderly** | Yes | 61 (81.3) | 14 (18.7) | 0.017 |
| | No/Maybe | 6 (50.0) | 6 (50.0) | |
| **5. Influenza vaccine is safe** | Yes | 38 (82.6) | 8 (17.4) | 0.136 |
| | No/Maybe | 29 (69.0) | 13 (31.0) | |
| **6. Being healthy protects against seasonal influenza** | Yes | 38 (71.7) | 15 (28.3) | 0.229 |
| | No/Maybe | 29 (82.9) | 6 (17.1) | |
| **7. Influenza vaccination may cause side effects** | Yes | 39 (73.6) | 28 (26.4) | 0.490 |
| | No/Maybe | 28 (80.0) | 7 (20.0) | |
| **8. Influenza is a serious illness for the elderly** | Yes | 66 (77.6) | 19 (22.4) | 0.077 |
| | No/Maybe | 1 (33.3) | 2 (66.7) | |
| **9. I would recommend influenza vaccination to the elderly in my work place** | Yes | 55 (83.3) | 11 (16.7) | 0.006 |
| | No/Maybe | 12 (54.5) | 10 (45.5) | |

Table 10 below shows how the nurses scored based on their different characteristics. The median score was 6.0 (SD 2). Vaccination status and vaccination status in the last season (0.001 and 0.002 respectively) were statistically significantly associated with the scores on nurses' knowledge and attitudes.

**Table 10. Knowledge and attitudes scores (0-9) according to nurses' characteristics and vaccination status**

| Nurses' characteristics and vaccination status | Description: Min. -Max., median scores and (sd) | | | P-value |
|---|---|---|---|---|
| **Median score, Min.-Max. (sd)** | 6, 1-9 (2.0) | | | |
| **Age groups** | <39 years | 1-9 | 6.0 (2.2) | 0.437 |
| | >40 years | 1-9 | 6.0 (1.9) | |
| **Gender** | Female | 1-9 | 6.0 (2.0) | 0.653 |
| | Male | 2-9 | 6.5 (3.2) | |
| **Working experience** | <19 years | 2-9 | 6.0 (2.0) | 0.887 |
| | >20 years | 1-9 | 6.0 (2.0) | |
| **Working relationship** | Full-time | 1-9 | 6.0 (2.1) | 0.246 |
| | Part-time | 6-8 | 7.0 (1.0) | |
| **Professional designation** | Practical nurse | 1-9 | 6.0 (2.1) | 0.281 |
| | Registered nurse | 1-9 | 6.0 (1.9) | |
| | Public health nurse | 2-9 | 7.0 (2.5) | |
| **Type of organization** | Home nursing | 1-9 | 6.0 (2.1) | 0.213 |
| | Sheltered housing | 2-9 | 7.0 (1.7) | |
| | Residential care | 1-9 | 6.0 (2.6) | |
| | Health center ward | 3-9 | 6.0 (4.2) | |
| | Other | 2-8 | 4.0 (2.0) | |
| **Vaccination status** | Yes | 2-9 | 6.0 (1.8) | 0.001 |
| | No | 1-9 | 4.0 (2.1) | |
| **Vaccination status in the last flu season** | Yes | 3-9 | 7.0 (1.4) | 0.002 |
| | No | 2-9 | 5.0 (2.2) | |

# 5 DISCUSSION

## 5.1 Influenza vaccination coverage in LTCFs

There was considerable variations in coverage between different service types both within and between different years (2008-2015). The highest being in residential care 73% (69-76%) followed by service housing 65% (54-77%) and lastly homecare 62% (57-68%). All individual coverage rates in different service types are below the EU and WHO recommended target of 75%. They are however higher than the national coverage for those above the age of 65 years (THL, 2016b). Additionally, the results established that the three different patient characteristics studied, age ≥80 years, poor cognition and poor ADL functioning influenced coverage.

The results provide new and important information on the use of influenza vaccine as can be seen in the variation in influenza vaccination rates among different service types over time. This can possibly be attributed to different practice patterns or cultures among the healthcare workers (possibly staff knowledge and attitudes) within respective service types. A similar observation was made by (Hirdes et al., 2006), though in their case it was attributed to attitudes towards immunization. Understanding this may help provide information on health promotion strategies needed to increase uptake of influenza vaccination. This might also suggest that nurses working in different settings should be targeted in the campaign.

Given that all the settings have similar recommendations, their implementation could help explain the variations observed. The differences depicted by different settings are important to understand, especially those with higher coverage and should be further investigated as it may help provide information on best practices. There is need to develop targeted campaigns and to also assess organizational factors that might influence uptake. Patient composition based on different patient characteristics as seen in the results could help explain the variations observed. However, the reason as to why patient composition causes such variation despite universal recommendation in the group should be further explored.

From the results, it can be seen that even though some of the different service types almost achieved the EU target of 75% in the year 2010, the downward trend in terms of coverage is a cause for concern. This is especially considering the fact that this are among the risk groups for whom influenza vaccine is recommended. The higher coverage in 2010 can be attributed to the 2009/2010 pandemic. The national average for the >65 years was 45% for the 2009-2010. The general downward trend exhibited by the service types can also be seen in >65 year olds national vaccination coverage (ECDC, 2015b).

The positive association between poor cognitive function and vaccine coverage in univariate model in homecare and residential care could be explained by the mean percentages presented in Table 3, homecare with the lowest coverage also had the lowest mean percentage of poor cognitive function individuals. This is a cause for concern and should be further pursued as it might lead us to seek to understand those responsible in making decisions on behalf of the cognitively impaired. Additionally, reasons for lower uptake among individuals with intact cognition should be well understood. As such, lower coverage among homecare clients should be further studied so as to determine the reasons behind it. Targeted interventions and educational programs should then focus on the underlying reasons.

The study has some limitations, fewer patient characteristics have been studied and even those that have been studied offers a partial view without comparison. For example, under cognitive function, the data used was only available for those with poor cognition, however, it would also be interesting to see how it compares to those whose cognition is intact. Age is also a limiting factor as only those above the age of 80 were assessed in the study.

These findings might not be generalizable to all LTCFs in Finland but even so, the variations observed gives an overall impression of what can be expected if a representative nationwide sample is conducted. Further research should be conducted to determine and understand additional predictors of influenza vaccination especially among those with low coverage. Going forward, vaccination coverage monitoring systems with a special focus on the risk groups for whom vaccination is highly recommended, in this case the elderly should be developed. RAI tool offers a great opportunity especially for

those residing in LTCFs. Data can then be used to address challenges in national vaccination programmes.

Only one observational study (Landi, Onder, Carpenter, Garms-Homolova, & Bernabei, 2005) in which Finland was a part of was conducted among 11 European countries using Minimum Dataset-Home care (MDS-HC). Unlike this current study which assesses 3 different service types, the former was only based on individuals receiving home care services. Therefore, this study one of its kind in Finland provides useful information on influenza vaccine coverage.

## 5.2 Knowledge and attitudes of nurses towards influenza vaccination

The interest to explore the knowledge and attitudes of nurses' towards influenza vaccination was informed by the fact that, nurses represent the highest percentage of healthcare workers involved in direct patient care (McEwen & Farren, 2005). As such, nurses may act as potential vectors of influenza to their patients. The results show that the uptake among the nurses is still low. Additionally, there was a close relationship between the nurse's vaccination status and their knowledge and attitudes.

In our convenient sample, among the 88 nurses who responded to the question on vaccination status, 76% (67) were vaccinated while 24% (21) were not. However, when asked about their ''Vaccination status in the last flu season'' only 52% reported being vaccinated while 48% were not. On professional designation, there was notable variation on vaccination coverage within different professional groups.

It can be seen from the results that knowledge and attitudes scores has a close relationship with the nurses' vaccination status. A similar finding was noted by (Nowak, Sheedy, Bursey, Smith, & Basket, 2015). It is important to understand whether these nurses play different roles in recommending the vaccination to their patients and to establish whether the knowledge gained through their education varies. If so, revision of the teaching contents or in-service training should be organized so as to constantly update their knowledge hence promoting informed decision making.

From the literature and the recommendations given on influenza vaccination, it is quite clear that its uptake is beneficial. Though a recent study by (De Serres et al., 2017) does not yet fully agree with that due to a claim of insufficient evidence. However, the vaccination coverage among the nurses still remains suboptimal as seen in the review by (Smith et al., 2016).

It is quite evident from the different responses that while others were statistically significantly associated with the vaccination status, others were not. The likelihood of recommending vaccination among the vaccinated nurses (table 9) is noteworthy and has been also reported by (Smith et al., 2016). This should be further explored as it might help guide in the planning of different educational content, in-service training and promotional campaigns so as to effectively target and address some contentious issues.

Due to the small sample size of the nurses within different units, it is difficult to fully explore the differences they pose in terms of coverage. Further studies should be conducted to explore such differences within units especially as has been witnessed in the variations in the RAI-HC data on the elderly. This would then provide an understanding that would help increase the vaccination coverage within different units hence benefiting both the nurses and their patients, in this case, the elderly.

The results are limited by the small number of participants in the study. However, the results provide a glimpse of what the general outlook might be like as the field seems unexplored in Finland especially with the current debate on ensuring effective HCWs vaccination with nurses being the majority. This will in turn provide important understanding of the topic and inform decision making.

# 6 CONCLUSIONS

The aim of the study was two-fold, it sought to determine trends in influenza vaccine uptake among the elderly within the LTCFs participating in the RAI-evaluation project in Finland. Additionally, the study aimed to explore the knowledge and attitudes of nurses towards influenza vaccination in LTCFs. As described below, the study was able to achieve its aims based on the set objectives.

The findings of this study show that there are variations in vaccination coverage among the elderly living in long-term care facilities. The coverage is still below the EU and WHO recommended target of 75% and that different patient characteristics influence vaccine uptake either positively or negatively. It also suggests that nurses' knowledge and attitudes does not only influence their ability to get vaccinated but also to recommend the vaccination to their patients.

Influenza recommendation among the nurses offering direct patient care should be encouraged to help reduce influenza disease burden among the elderly receiving long-term care. In addition to providing direct patient care, nurses are considered to be the highest number of HCWs. As such, achieving a greater vaccine uptake amongst them will be beneficial to both them and their patients.

In light of available evidence, influenza vaccination is still considered the most important preventive measure against influenza. More emphasis should be put on the risk groups for which influenza vaccination is recommended to. It should be remembered that transmission of influenza within healthcare settings, LTCFs included is a matter of patient safety. Ensuring patient safety is an obligation that should be adhered to by HCW as it benefits both themselves and their patients.

The data used in this study provide grounding for which to conduct further research on this important public health topic in Finland.

# 7 REFERENCES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# 8 APPENDICES

## Appendix 1/1

### SAATEKIRJE

Hyvä vastaaja,

Olen Christopher Kipkorir. Opiskelen Tampereen yliopiston kansainvälisessä terveystieteiden maisteriohjelmassa. Työskentelen parhaillaan lopputyöni parissa.

Tämä kysely on osa lopputyötäni, ja kyselyn tarkoituksena on ymmärtää mielipiteitänne koskien influenssaa ja influenssarokotetta.

Arvostaisin suuresti osallistumistanne tähän anonyymiin kyselyyn. Palauttamalla kyselylomakkeen ilmaisette halunne osallistua kyselyyn.

Olkaa hyvä ja vastatkaa kaikkiin kysymyksiin huomioiden, että kysymyksiin ei ole olemassa oikeita ja vääriä vastauksia. Näkemyksenne on tärkeä.

Kyselyn tulosten avulla pyritään ymmärtämään mitkä tekijät vaikuttavat työntekijöiden influenssarokotteen ottamiseen ja kuinka ikäihmisten influenssarokotekattavuutta voidaan parantaa.

Lämmin kiitos vastauksistanne!

Ystävällisesti, Christopher Kipkorir. Kipkorir.christopher.x@student.uta.fi

| **Influenssarokotekysely**<br><br>**A. Taustatiedot** | | |
|---|---|---|
| Ikä_____ | Työkokemus hoitajana (vuosina)_____ | Sukupuoli<br>☐ Nainen ☐Mies |
| Koulutus<br>☐ Lähi-/perushoitaja<br>☐ Sairaanhoitaja<br>☐ Terveydenhoitaja | Työsuhde<br>☐ Kokoaikainen<br>☐ Osa-aikainen | Organisaatio<br>☐ Kotihoito<br>☐ Palvelutalo<br>☐ Vanhainkoti<br>☐ Vuodeosasto<br>☐ Jokin muu (mikä_____ |

**B. Rokotushistoria**

1. Oletko koskaan saanut influenssarokotetta? ☐ Kyllä ☐ Ei

2. Jos olet, saitko rokotuksen edellisellä influnssakaudella? ☐ Kyllä ☐Ei

3. Onko sinulla vasta-aiheita (esim. epäilty allerginen reaktio) influenssarokotteelle?
   ☐Kyllä, mikä?_____ ☐ Ei

4. Aiotko ottaa influenssarokotteen seuraavalla influenssakaudella?
   ☐Kyllä ☐Ei ☐ Ehkä

**C. Oletko samaa mieltä seuraavien väittämien kanssa?**

1. Influenssarokote pienentää influenssan tartuttamisen riskiä
   ☐Kyllä ☐Ei ☐ Ehkä

2. Influenssarokote suojaa influenssatartunnalta
   ☐Kyllä ☐Ei ☐Ehkä

3. Influenssarokote on turvallinen
   ☐Kyllä ☐Ei ☐Ehkä

4. Influenssarokote on tehokas suoja influenssaa vastaan
   ☐Kyllä ☐Ei ☐Ehkä

5. Hyvä terveydentila suojaa influenssalta
   ☐Kyllä ☐Ei ☐Ehkä

6. Influenssarokote on tärkeä ehkäisykeino influenssa vastaan ikäihmisillä
   ☐Kyllä ☐Ei ☐Ehkä

7. Influenssarokotteella voi olla haittavaikutuksia
   ☐Kyllä ☐Ei ☐Ehkä

8. Influenssa on vakava sairaus ikäihmisille
   ☐Kyllä ☐Ei ☐Ehkä

| |
|---|
| 9. Suosittelisin influenssarokotetta kaikille ikäihmisille työpaikallani<br>☐Kyllä ☐Ei, miksi?_____ ☐Ehkä |

Kiitos vastauksistanne ☺

**Appendix 1/2**

**COVER LETTER**

Dear respondent,

My name is Christopher Kipkorir, a master of public health student at the University of Tampere working on my final project.

The aim of this knowledge and attitudes survey is to better understand your opinion about seasonal influenza and seasonal influenza vaccination.

Your willingness to participate in answering this ANONYMOUS survey will be highly appreciated. This will also act as your consent to participate.

Pleases answer ALL the questions and remember there are no right or wrong answers, your opinion is important.

Thank you for taking your time to respond to this questions.
Yours faithfully, Christopher Kipkorir. Kipkorir.christopher.x@student.uta.fi

| **Seasonal influenza vaccination survey** | | |
|---|---|---|
| **D. Demographics** | | |
| Age in years_____ | Working experience as a nurse (years)_____ | Gender<br>☐ Female ☐Male |

| | | |
|---|---|---|
| Educational level<br>☐ Practical nurse<br>☐ Registered nurse<br>☐ Public health nurse | Current employment status<br>☐ Full time<br>☐ Part time<br>☐ Casual | Type of organization<br>☐ Home nursing<br>☐ Service housing<br>☐ Residential care<br>☐ Other<br>*Please mark residential care if you work in a healthcare center hospital ward. |
| **E. Vaccination status/history** | | |
| 5. Have you ever been vaccinated against influenza? ☐Yes ☐No | | |
| 6. If YES, were you vaccinated in the current flu season? ☐Yes ☐No | | |
| 7. Do you have any contraindications to receiving seasonal influenza vaccination?<br>☐Yes ☐No | | |
| 8. Do you plan to be immunized against seasonal influenza in the next flu season?<br>☐Yes ☐No ☐ Not sure | | |
| **F. Do you agree with the following statements** | | |
| 10. Seasonal influenza vaccination reduces the risk of transmitting influenza<br>☐Yes ☐No ☐Unsure | | |
| 11. Seasonal influenza vaccination provides self-protection ☐Yes ☐No ☐Unsure | | |
| 12. Seasonal influenza vaccine is safe ☐Yes ☐No ☐Unsure | | |
| 13. Seasonal influenza vaccine is effective in preventing seasonal influenza<br>☐Yes ☐No ☐Unsure | | |
| | | |

| |
|---|
| 14. Being generally healthy protects against seasonal influenza ☐Yes ☐No ☐Unsure |
| 15. Seasonal influenza vaccination is an important preventive measure for the elderly? ☐Yes ☐No ☐Unsure |
| 16. Seasonal influenza vaccination may cause side-effects ☐Yes ☐No ☐Unsure |
| 17. Influenza is a serious illness for the frail and elderly ☐Yes ☐No ☐Unsure |
| 18. Seasonal influenza vaccination is recommended for all the elderly patients in YOUR place of work ☐Yes ☐No ☐Unsure |

Thank you for your answers ☺