PERCEPTION OF BCG VACCINATION; STUDY ON IMMIGRANT PARENTS IN EASTERN FINLAND.

Yuliya Evdokimova
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Public Health
School of Medicine
Faculty of Health Sciences
University of Eastern Finland
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Tuberculosis has been among the leading causes of disability and death worldwide for a long time. However, the burden of disease is distributed unequally both among countries and within populations. Unfavorable socio-economic conditions play important role for getting tuberculosis infection and for the development of the disease. Therefore, in Western countries some groups of population, including immigrants and their children, are at high-risk group for tuberculosis. BCG is the only vaccine available against the disease, but the protective capacity is limited. In the countries, including Finland, where TB incidence is low, vaccination against tuberculosis is not compulsory and is recommended for children from a high-risk group. The latter includes children from immigrant families. The decision on BCG vaccination of the child is done by parents after recommendation of medical personnel, so the parental opinion, attitude towards vaccination, as well as socio-economic factors, play important role in the decision making.

The survey was done for master’s thesis. The objectives of the study were to reveal possible factors that influence on the perception of BCG vaccination and tuberculosis among mothers for whose children the vaccination was recommended (children from immigrant families). The questionnaire, which was introduced in Finnish, Russian, and English was distributed among 14 maternity and child health clinics in Kuopio for three months. Nurses were persons in charge for the introduction of the questionnaire.

In general, 24 questionnaires were available for analysis. According to the results, only one child did not receive BCG (the reason was medical contraindication). There was a positive attitude towards BCG vaccination among mothers, especially among those with average level of income and higher level of education (university degree or PhD). The respondents who were not going to return to their home country and read local newspapers regularly tended to reject the possibility of getting TB in Finland. The majority of parents believed that there was a negative attitude towards TB infected people in society. Women who had had an experience on communication with a person suffered from the disease felt risk for their health in this situation.
Acknowledgment

I would like to express my gratitude to the health authorities of Kuopio, to all nurses from the maternity and child health clinics, and to the respondents for their kind collaboration in the provision of the survey.

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### Abbreviations

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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AUD</td>
<td>alcohol use disorder</td>
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<tr>
<td>BCG</td>
<td>bacillus Calmette- Guerin</td>
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<tr>
<td>BMI</td>
<td>body mass index</td>
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<tr>
<td>EEA</td>
<td>European Economic Area</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<td>Global DRS</td>
<td>Global Project on Anti-Tuberculosis Drug Resistance Surveillance</td>
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<tr>
<td>IFN-γ</td>
<td>interferon-γ</td>
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<tr>
<td>IGRA</td>
<td>Interferon – γ Release Assay</td>
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<tr>
<td>IL</td>
<td>interleukin</td>
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<tr>
<td>LTB</td>
<td>latent tuberculosis infection</td>
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<tr>
<td>MDR-TB</td>
<td>Multidrug- resistant tuberculosis</td>
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<tr>
<td>MMR</td>
<td>Measles, Mumps, and Rubella</td>
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<tr>
<td>NTSS</td>
<td>National Tuberculosis Surveillance System</td>
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<tr>
<td>PAF</td>
<td>population attributable fraction</td>
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<tr>
<td>PPV</td>
<td>positive predictive value</td>
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<td>PR</td>
<td>prevalence ratio</td>
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<tr>
<td>RR</td>
<td>risk ratio</td>
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<tr>
<td>SCID</td>
<td>Severe Combined Immune Deficiency</td>
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<tr>
<td>SSI</td>
<td>Statens Serum Institut</td>
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<tr>
<td>TB</td>
<td>tuberculosis</td>
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<tr>
<td>TST</td>
<td>tuberculin skin test</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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<tr>
<td>XDR- TB</td>
<td>Extensively drug- resistant tuberculosis</td>
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1 Introduction

Tuberculosis (TB) emerged as a global problem in the early 1990s and its eradication is still a challenge to the world community. Moreover, multidrug-resistant TB (MDR-TB) presents additional difficulties in the disease management and control (World Health Organization 2012).

While in developed countries the number of communicable diseases is diminishing steadily in developing countries infectious diseases are still an urgent issue (World Health Organization 2008a). Tuberculosis is one of the most commonly diagnosed transmissible disease among immigrants (Limina et al. 2013), and the interaction between TB dynamics and change in immigrant subpopulation has been observed in many societies (European Centre for Disease Prevention and Control/WHO Regional Office for Europe 2013). Tuberculosis in this group of population has several distinguishing features. Therefore, the transmission and clinical course in people of foreign origin might differ from the local cases. Furthermore, many TB risk factors have social background and immigrants are more prone to them.

A set of preventive measures are the main contributors to the disease eradication. For infectious diseases vaccination plays one of the central roles. In the case of tuberculosis, the only available vaccine Bacillus Calmette-Guerin (BCG) does not have a complete protective effect but it is strongly recommended by the World Health Organization (WHO) as a compulsory vaccine in the high burden settings (World Health Organization 2004). In Finland, along with other developed countries, the incidence of tuberculosis is low, so vaccination is recommended only for the representatives of high-risk groups. A high-risk group would include children who were born in Finland but whose parent (or both parents) is from a high incidence country (Rapola 2007). The parents at the advice of medical personnel decide about the need for the vaccination. Under such conditions the parental attitude towards vaccination and disease plays an essential role. Moreover, the opinion might vary according to the country of origin and the socio-economic characteristics of the parents.

There are not so many studies done to define the factors that influence the immigrant parents’ perception concerning vaccination. To our knowledge, there are no studies that explore the issue about BCG vaccination. In the current cross-sectional study we made an attempt to reveal possible factors that might play a role in the attitude towards the BCG
vaccination and tuberculosis among the mothers of the children in the risk group (children for whom the vaccination was recommended).

2 Literature review

2.1 Global tuberculosis trends and epidemiology
The global efforts on tuberculosis control and eradication led to a significant decline in the number of new cases and mortality due to the disease worldwide. The number of new cases decreased by 2.2% between 2010 and 2011, and mortality has fallen by 41% since 1990 (Figure 1). However, the disease is still among the top global killers and the causes of disability (World Health Organization 2012).

![Figure 1. Trends in mortality due to tuberculosis among HIV-negative people (per 100 000) by WHO Regions (Africa, Americas, Eastern Mediterranean region, Europe, South-East Asia, Western Pacific region, and global data) based on WHO data (World Health Organization 2013b).](image)

In 2011 tuberculosis caused about 20 deaths per 100 000 population worldwide (both among HIV negative and HIV positive patients), while overall incidence of TB can be estimated as 125 cases per 100 000 (World Health Organization 2012).
While there are no exact TB statistics for children but in 2011 the number of new TB case notifications among those aged less than 15 years old was evaluated as 327 000; estimated incidence was about 490 000 (470 000- 510 000), and deaths from TB in children without HIV infection accounted for 64 000 (58 000- 71 000). Thus, it was assumed that 6% of all incidence and death cases due to TB were among children (World Health Organization 2012).

Smear- positive tuberculosis cases data were presented as stratified by age and sex. In this group the most affected proportion of population was 15- 64 years old (85% of cases); overall male/ female sex ratio was 1.9 (variation is from 0.5 in Vietnam to 3.0 in Afghanistan). For smear- negative pulmonary cases incomplete disaggregated data by sex and age was reported. By means of estimation the same age group (15- 64) accounted for 88% of all cases and average male/female ratio was 1.7 (World Health Organization 2012).

Despite improvements in the management of tuberculosis such forms of the disease as MDR- TB and extensively drug- resistant TB (XMDR-TB) are not under proper control. These forms of the disease need complicated and prolonged treatment because MDR- TB is resistant to first- line drugs (rifampicin and isoniazid), and XMDR-TB has a wide spectrum of drug resistance (European Centre for Disease Prevention and Control/ WHO Regional Office for Europe 2013). According to the World Health Organization (WHO), MDR- TB is the cause of about 20% of previously treated and 3.7% of new TB cases (World Health Organization 2012).

Uncertainties in the presented numbers are the result of the difficulties in TB incidence and prevalence evaluation at national level as the direct estimation would demand many tangible and intangible resources. For instance, in a high burden settings prevalence is measured by means of population surveys in certain time periods, and the size of average population sample should be 50 000 people with average cost of 1-4 million US dollars per study (Glaziou et al. 2008). In the countries with a good surveillance system incidence can be estimated directly from notified cases. However, in developing states the incidence and prevalence are calculated from average numbers. The numbers are approximate due to limited access to TB treatment, poor diagnostics, and the absence of linkage between private and governmental health care facilities. (Glaziou et al. 2013). TB cases, which should be notified, are divided into groups. The classification is based on the level of certainty. The tuberculosis suspect (person with common symptoms of the disease); the
case of tuberculosis (any person who was given treatment against TB based on physician’s diagnosis); and defined case of tuberculosis (if presence of Mycobacterium is confirmed by laboratory finding as sputum smear, culture, or molecular line probe assay) (World Health Organization & Stop TB Department 2010).

2.2 Epidemiological situation in high burden countries
The burden of disease differs dramatically among countries (Fig 2, 3, 4 and 5). In general 96 countries are responsible for 89% of all new TB cases in the world. But the highest rates of incidence, prevalence, and mortality is observed in 22 countries: Afghanistan, Bangladesh, Brazil, Cambodia, China, DR Congo, Ethiopia, India, Indonesia, Kenya, Mozambique, Myanmar, Nigeria, Pakistan, Philippines, Russian Federation, South Africa, Thailand, Uganda, UR Tanzania, Viet Nam, and Zimbabwe. Furthermore, in 2011 five countries had the highest TB incidence: India, China, South Africa, Indonesia, and Pakistan. Regarding TB associated with HIV infection, the highest rate was in African region (39%), and it numbered about 79% of all HIV cases associated with TB worldwide. According to the reported data, in high burden countries across all WHO regions the majority of new smear positive tuberculosis cases were registered in the age group “15-44” (World Health Organization 2012). It is the most employable group of population.

In the list of 27 high MDR-TB burden countries all are developing states, whereas more than a half are ex-Soviet Union countries where the problem of MDR-TB is especially urgent. These countries are Armenia, Azerbaijan, Bangladesh, Belarus, Bulgaria, China, DR Congo, Estonia, Ethiopia, Georgia, India, Indonesia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Myanmar, Nigeria, Pakistan, Philippines, Republic of Moldova, Russian Federation, South Africa, Tajikistan, Ukraine, Uzbekistan and Viet Nam (World Health Organization 2012). In the non-EU/EEA countries, which belong to the European WHO Region, the rate of MDR-TB among all cases increased from 20.3% to 30.2% for four year period (from 2007 to 2011) (European Centre for Disease Prevention and Control/WHO Regional Office for Europe 2013).
Figure 2. Trends in the incidence of tuberculosis (per 100 000) by the WHO Regions (Africa, Americas, Eastern Mediterranean region, Europe, South-East Asia, Western Pacific region, and global data) based on WHO data (World Health Organization 2013a).

Figure 3. Trends in the prevalence of tuberculosis (per 100 000) by the WHO Regions (Africa, Americas, Eastern Mediterranean region, Europe, South-East Asia, Western Pacific region, and global data) based on WHO data (World Health Organization 2013b).
Figure 4. Trends in the incidence of tuberculosis (per 100 000) by World Bank Income Groups (high income group, low income group, lower middle income group, upper middle income group and global data) based on WHO data (World Health Organization 2013a).

Figure 5. Trends in the prevalence of tuberculosis (per 100 000) by World Bank Income Groups (high income group, low income group, lower middle income group, upper middle income group and global data) based on WHO data (World Health Organization 2013b).
2.3 Epidemiological situation in EU/EEA countries

A positive trend in tuberculosis epidemiology in the countries of the European Union (EU)/European Economic Area (EEA) has been observed for many years. Only several countries have a high priority in respect of tuberculosis in the area. They are Bulgaria, Estonia, Latvia, Lithuania, and Romania with notification rates (per 100 000) 32.1, 25.4, 39.7, 58.7, and 89.7 respectively (European Centre for Disease Prevention and Control/WHO Regional Office for Europe 2013).

In general, in 2011 the total number of TB cases reported in the EU/EEA countries were 72 334, while 24% of these cases were in Romania. Newly diagnosed of the reported cases were 80%, 12% were previously treated, and 8% were with unknown previous treatment status. The most affected age group was the “25-44” years old that accounted for about 20-40% of the total number of cases in almost all countries of the region. This age group, together with “45-64” age group, contributed 64% of all new cases. In general, there is a big difference in notification rate among countries of the region from the lowest number (2.8) in Iceland to the highest in Romania (89.7). Average notification rate in the region was 14.2 per 100 000. Men/women ratio was 1.8. In 2010 74% of notified cases were treated successfully (European Centre for Disease Prevention and Control/WHO Regional Office for Europe 2013).

The highest proportion of MDR-TB was diagnosed in three Baltic countries Estonia (22.9%), Latvia (12.6%), and Lithuania (11.1%) (European Centre for Disease Prevention and Control/WHO Regional Office for Europe 2013).

In the EU/EEA area the number of TB cases of foreign origin has been rising since 2001. In 2011 the proportion of cases among foreigners was 26% out of all notified. In some countries (Austria, Norway, and the UK) the trend can be explained by real increase in tuberculosis cases among immigrants, but in some states (Czech Republic, France, and Germany) this picture is probably observed due to the diminishing number of native cases (European Centre for Disease Prevention and Control/WHO Regional Office for Europe 2013).

In children under 15 years old 43% of extrapulmonary tuberculosis cases was diagnosed, and it numbered 22% of all cases reported in 2011. It is important to notice that children had twofold chances to have extrapulmonary form of TB compared with adults (Prevalence Ratio (PR) = 2.1, CI 1.9-2.1), whereas the risk of lymphatic TB and meningitis in children
was higher two times and 40% respectively. Other forms of extrapulmonary TB (affecting bone, pleura, gastrointestinal tract, spine, urogenital area, and disseminated form of the disease) were less likely to be found in children (European Centre for Disease Prevention and Control/ WHO Regional Office for Europe 2013).

2.4 Epidemiological situation in Finland

Finland shifted to a new TB notification system in 2007. The previous notification practice demanded notification of cases confirmed by laboratory test (sputum smear or culture positive). However, according to the new recommendations on infectious disease surveillance accepted in the EU, all cases suspected as TB and treated as TB have to be notified. The change in surveillance system has not influenced on the number of new cases, and the constant decrease in TB cases in Finland has been observed (Jaakola et al. 2012).

In 2011 the total number of TB cases was 326 corresponding to 6.1/ 100 000. Out of this number 72% of cases were pulmonary, and 36% were sputum positive. Only 2% (six cases) were found in HIV infected individuals. The average estimated number of MDR-TB was 7-1-13 (best- low- high scale) (European Centre for Disease Prevention and Control/ WHO Regional Office for Europe 2013). The outcome was favorable in 73% (cured cases and cases with completed treatment) (Jaakola et al. 2012).

The majority of the patients with TB (75 %) were born in Finland and the current disease was a result of reactivation of the infection acquired in their youth. In the Finnish born group the age range of 58% (188 cases) were “60- 74” and “75 or more”. People born abroad constituted 25% of all TB cases registered in 2011. In this group the age range for 80% (64 cases) of patients was “15- 44” (Jaakola et al. 2012).

2.5 Etiology and pathogenesis of tuberculosis

The disease called “tuberculosis” had been known for a long time. Although, the first step towards purposeful fight against the disease was the discovery of the etiological factor Mycobacterium tuberculosis by Robert Koch on March 24, 1882. Among spices adhering to Mycobacterium tuberculosis complex (complex includes M. tuberculosis, M. africanum, M. bovis, and M. microti) the causative agent in humans is mainly M. tuberculosis (Srivastava & Shetty 2009); M. bovis causes disease in animals including cattle. In humans it contributes to a small proportion of tuberculosis cases (about 3.1 %). The transmission of this type of Mycobacterium occurs mainly by means of close contact with infected animal or consumption of unpasteurized milk products (Cosivi et al. 1998). Therefore, the main
burden of the disease caused by this pathogen is observed in developing countries, where control measures preventing transmission are not sufficient. However, in developed countries tuberculosis caused by *M. bovis* has been found in HIV infected people, and evidences support the probability of person to person infection transmission among HIV infected individuals. Moreover, *M. bovis* demonstrates higher rates of drug resistance (Samper et al. 1997, Evans et al. 2007).

*M. tuberculosis* is an obligatory aerobic intracellular pathogen. This definition describes the main features of the pathologic process. The way of transmission is airborne, so inhaled droplet nuclei containing bacilli (the size of the inhaled particles should be about 5 µm (Harries et al. 2004)) reaches highly oxygenated lung alveoli (Srivastava & Shetty 2009). In alveolus local immune cells macrophages catch the infectious agent, but immunity towards pathogen develops slowly from six to twelve weeks. During this time bacilli remains within macrophage, and the intracellular localization of mycobacterium explains the fact that mainly cellular immunity involves in the immune response. In the course of immune response formation, lymphocytes (CD4+ and CD8+ T cells) produce cytokines (interleukins (IL) and interferon-γ (IFN-γ)). Cytokines activate macrophages, and they in turn inhibit replication of bacteria. Thus, local granulomatous lesion forms.

If microorganisms get to the lymph or bloodstream, infection can spread to different organs. Therefore, by place of localization tuberculosis is divided into pulmonary TB (affecting lungs) and extrapulmonary (infection may be localized in lymph nodes, bones and joints, genitourinary area, peritoneum and intestine, pericardium, larynx, and other organs). The most life threatening form of the disease is miliary or disseminated, which occurs if the infection extensively spreads throughout the body (Srivastava & Shetty 2009).

If the host immunity is impaired and cannot provide sufficient protection, initial contact with *Mycobacterium* leads to primary TB infection. However, one of the main features of the pathogen is its potential to inhibit activity of phagosomes and remain intact within macrophages for a long time. This ability is the prerequisite for the latent tuberculosis infection (LTB). The condition when the infectious agent is inactive and no symptoms of the active disease are observed. If conditions become favorable, latent form converts into reactivation or post-primary TB (Srivastava & Shetty 2009). The diagnostics of latent tuberculosis is based on positive Tuberculin Skin Test (TST) (Kinnery 2004) or Interferon-γ Release Assay (IGRA). The latter is a respectively new in vitro method of TB diagnostics
based on the detection of specific type of interferon, which is released in response to *Mycobacterium tuberculosis*. The advantage of the test is that the results are not skewed by preceding Bacillus Calmette Guerin vaccination. The method is supposed to have higher positive predictive value (PPV) and higher specificity compared with TST (Diel et al. 2011, Diel et al. 2012), but it does not have sufficient sensitivity, and its ability to detect extrapulmonary tuberculosis is limited (Fan et al. 2012). Therefore, the final diagnosis should be confirmed with additional diagnostic methods (chest X-ray, sputum microscopy, and culture) (Kinnery 2004).

### 2.6 Tuberculosis risk factors

The essential prerequisite for tuberculosis development is getting *Mycobacterium* from the outer environment. The airborne way of transmission defines risk factors for getting *Mycobacterium tuberculosis*: the duration of contact with infected person and the amount of droplet nuclei in the air (Harries et al. 2004). The latter is exacerbated by high density of population in dwellings. Indeed, the role of crowding in tuberculosis transmission cannot be underestimated. Ecological study held in Canada demonstrated that the majority of registered tuberculosis cases occurs among people living in buildings with higher residential density and in new blocks of flat (this fact can be explained by poor ventilation facilities in this type of buildings). As the result of public health measures and contact tracing such indicator as “the number of persons per square meter” did not predict tuberculosis occurrence in the study (Wanyeki et al. 2006). The high prevalence of tuberculosis in prisoners is partially explained by crowding (Baussano et al. 2010). Relative risk (RR) for tuberculosis in the places of detention can reach 1445 as it was calculated for Slovakia, so people with history of imprisonment might contribute significantly into the overall burden of the disease in a population. The high number is the result of concentration of vulnerable, in respect to tuberculosis, groups of population (including immigrants from high burden countries) and poor preventive measures in such institutions (European Centre for Disease Prevention and Control/ WHO Regional Office for Europe 2013).

The risk to become infected depends on the level of contagiousness of strain. Tuberculosis strains have different degrees of virulence and different patterns of immune response from host organism, so more aggressive strain is also more infective as animal model shows (Marquina-Castillo et al. 2008). The control of *Mycobacterium* transmission as well as investigation of factors assisting the infection spread are essential, because in both low and
high burden settings a significant part of TB cases (40.9% and 44.7% respectively) occurs due to recent transmission (Nava- Aguilera et al. 2009). Furthermore, the analysis of tuberculosis cases among people with latent tuberculosis infection and those who were exposed to *Mycobacterium* for the first time demonstrated that the incidence of active tuberculosis in latently infected individuals was much lower compared to newly infected subjects. However, in this analysis essential predisposing factors such as HIV coinfection and old age were not evaluated (Andrews et al. 2012).

In general, only 10% of infected individuals develop active disease during the life course (Harries et al. 2004). So, what are the risk factors that define the progression of the disease and the development of active form?

### 2.7 Social determinants of tuberculosis

During human history tuberculosis has been a social disease connected to poverty and inequality. Prevalence of TB is negatively associated with Gini coefficient. It is the measure of income inequality in population that ranges from zero (perfect equality) to one (perfect inequality). Therefore, social disparity leads to higher rates of tuberculosis. In the WHO European region the higher number of Gross Domestic Product *per capita* is a negative predictor of prevalence and incidence of TB (Ploubidis et al. 2012).

However, poverty is rather broad definition which includes a variety of factors as lack of money, malnutrition, poor housing, lack of education, poor access to health care etc. There are different approaches to evaluate the degree of deprivation, and it is difficult to evaluate the factors that contribute to poverty separately as they are too closely related to each other. For example, in an ecological study conducted in the USA the socio-economic deprivation in the regions was assessed as high proportion of people below poverty line, level of household crowding, unemployment rate in the area, car, and home ownership. The analysis demonstrated that in areas where socio-economic situation is worse, the annual TB incidence is also higher (Lopez De Fede et al. 2008).

The interaction between education and tuberculosis (tuberculosis risk factors) were demonstrated in other studies. Low educational level or insufficient knowledge about tuberculosis is a risk factor of delay in diagnostics (Storla et al. 2008). “Unknown” or “primary school or less” education of mother was a predictor of progression of tuberculosis in adolescents in South African cohort study (Mahomed et al. 2013). The knowledge of the
disease transmission path without misconception was positively associated with higher education level (Sreeramareddy et al. 2013).

2.8 Other risk factors
At population level it is conventional to use such indicator as the Population Attributable Fraction (PAF). The indicator defines the contribution of a risk factor to a disease or death. It presents the decrease in morbidity or mortality if the exposure to the risk factor attributable to the disease would be minimized within a population to the ideal level (or absent) (World Health Organization). Regarding tuberculosis the analysis of the 22 high TB burden countries demonstrated that the PAF is rather high for TB risk factors such as malnutrition (27%), smoking (23%), HIV (19%), diabetes (6%), alcohol abuse (13%), and indoor air pollution (26%). It is crucial to notice that the TB PAF for HIV varies depending on the region; the contribution of HIV can be much higher in the countries where the prevalence of human immunodeficiency virus in population is also high (Jeon & Murray 2008). The majority of the listed risk factors are more common in developing countries, but alcohol abuse (World Health Organization 2007b) and diabetes (Danaei et al. 2011) are problems in developed countries as well.

2.8.1 Nutritional status
There are few studies that are done on the association between nutritional status and tuberculosis. Historically, it is known that during starvation periods the incidence of tuberculosis increases, and severe malnutrition is a recognized risk factor for TB development in children (World Health Organization 2006). The US cohort study showed that people with a low Body Mass Index (BMI) were at a higher TB risk compared with overweight, obese, or those who had a normal weight. Notably, no difference was found in the incidence of tuberculosis among different ethnic groups in this study. Protein deficiency, as an indicator of malnutrition, was shown to be a risk factor of the disease development (Cegielski et al. 2012). In turn infection interferes into protein metabolism as it was observed in a study among TB patients. Compared with healthy and malnourished subjects, TB patients had a higher rate of protein oxidation which led to a lower protein balance (Macallan et al. 1998).

Vitamins and microelements are also supposed to be involved in susceptibility to the disease. Hemilä et al investigated the possible dietary influence of vitamin C in tuberculosis in Finnish men cohort of smokers (Alpha- Tocopherol, Beta-Carotene Cancer
Prevention Study) and came to the conclusion that not vitamin C but other substances from fruits and vegetables might reduce the risk of tuberculosis (Hemilä et al. 1999).

While vitamin D status is linked to tuberculosis progression, the direction of this relationship is not completely clear. There is still the question: “does deficiency lead to the disease development or does tuberculosis provoke deficiency?” According to the results of meta-analysis, 70% of those with the disease have a lower level of vitamin D compared to the disease free individuals (Nnoaham & Clarke 2008). Though, intensive vitamin D supplementation of patients with active tuberculosis did not show sufficient improvement in serum concentration of 25- hydroxycholecalciferol (metabolite of vitamin D) unlike healthy contacts. Moreover, TB patients did not show an expected increase in serum concentration during summer months. The diet pattern and sunlight exposure in the cases and the controls were similar, and additionally no distinction was found between the skin color and vitamin D serum concentration. So the difference in vitamin D utilization cannot be explained by these factors (Sita-Lumsden et al. 2007).

Antimicrobial activity against Mycobacterium tuberculosis, which vitamin D demonstrates, is under investigation. In vitro studies revealed that active metabolite of vitamin D inhibits Mycobacterium tuberculosis development in macrophages by means of autophagy activation (Campbell & Spector 2012). Also, it was observed that the bactericidal potential of the vitamin develops in combination with cathelicidin. The latter is an antimicrobial peptide that is stored in macrophages or neutrophils and has a broad spectrum of antimicrobial activity (Bals & Wilson 2003, Liu et al. 2007).

2.8.2 Smoking
Smoking increases the risk of TB infection in 1.7 times and increases the risk for disease development in 2.3- 2.7 times (Bates et al. 2007). Those who smoke have a higher risk for latent TB infection and development of active disease. They are at higher risk for the death due to tuberculosis. Findings showed that children exposed to inhalation of tobacco smoke had a higher risk for disease progression (Lin et al. 2007). The situation for both smoking and tuberculosis is worse in developing countries. Low and middle income countries are more susceptible to deaths associated with tobacco use and the gap between developing and developed countries is predicted to increase (World Health Organization 2011b). There is also a difference in the smoking prevalence between genders. The smoking prevalence is the highest among men in the lower- middle- income countries, while in upper- middle and
high-income countries the proportion of women who smoke increases (World Health Organization 2011a).

There are no sufficient amount of epidemiological studies confirming the association between indoor air pollution and tuberculosis development. The existing research papers do not meet the quality criteria. Nevertheless, the majority of authors reported that the biomass fuel usage increases the risk of TB in individuals (Bates et al. 2007).

2.8.3 Diabetes mellitus

Diabetes mellitus is a confirmed risk factor for the development of active form of TB. For the people suffering from diabetes the risk of tuberculosis progression into active form is about three times higher. The effect is more evident in young people in countries with high incidence rates. Moreover, some geographical difference was observed: in non-North American countries the association is stronger (Jeon & Murray 2008).

2.8.4 Human Immunodeficiency Virus (HIV)

HIV infection increases dramatically the lifelong risk of tuberculosis development. If risk to develop the disease in HIV negative person is 5-10%, in HIV positive individuals the risk increases up to 50% (Harries et al. 2004). In African countries HIV infection associated with tuberculosis is one of the main causes of maternal death (Grange et al. 2010). Evidences show that recurring tuberculosis disease in HIV infected patients is mainly due to re-infection than due to relapse (Crampin et al. 2010, Sonnenberg et al. 2001, Houben et al. 2011), so people with HIV are more susceptible to environmental Mycobacterium. Clinical pattern of tuberculosis in patients with HIV co-infection is characterized by more frequent extra pulmonary lesions (Fitzgerald & Houston 1999).

All sides of interaction between Mycobacterium tuberculosis and HIV virus are still unknown. The most investigated mechanism is the impairment of immune defense cells (CD4+ lymphocytes and macrophages) by the virus. The damage of immune cells by turn weakens the immune response against Mycobacterium (Walker et al. 2013).

Health risk behaviors, prevailing among people living with HIV, exacerbate the susceptibility. The factors increasing risk for tuberculosis are current drug use, lack of control of HIV infection, low BMI, anemia, previous diagnostics of latent tuberculosis infection without following treatment, and illiteracy (Batista et al. 2013).
2.8.5 Alcohol abuse

Heavy alcohol consumption (more than 40 g of alcohol per day) or alcohol use disorder (AUD) increases the risk of tuberculosis in about three times (Löflund et al. 2008). Moreover, alcohol abuse, as well as homelessness, increases the risk of recent tuberculosis transmission almost in two times (Nava-Aguilera et al. 2009).

For a long time the connection between alcohol abuse and tuberculosis was observed, but the mechanism was not clear enough. According to the comprehensive review done by Rehm et al., the connection between heavy drinking / AUD (alcohol usage disorder) meets all main epidemiological criteria supporting the eligibility of association. The paper explains possible biological and social pathways of this association. The negative influence of alcohol on immunity by means of suppressing function of macrophages, CD4, and CD8 cells is biological mechanism. However, it is unclear is it the result of direct influence of alcohol consumption or indirect consequence of alcohol induced malnutrition, liver diseases, or poor hygiene. The social pathway influencing on tuberculosis susceptibility is such social consequences of alcoholism as homelessness, malnutrition, crowding, imprisonment etc. (Rehm et al. 2009).

2.8.6 Genetics

The role of inheritance in tuberculosis susceptibility is not clear. It was observed that some ethnic groups are more prone to the disease, but the results might be confounded by the disparities in socio-economic status. Nevertheless, there is an interest towards the genetic predisposition to tuberculosis, and some genes were shown to be linked to its development.

Vitamin D receptor polymorphism genes are possible candidates. Meta-analysis showed that a significant association between two variants of vitamin D receptor polymorphism (Fok I and Bsm I) and tuberculosis susceptibility was defined only in Asians (Fok I OR 2, CI 1.3-3.2; Bsm I OR 0.5, CI 0.4-08), whereas in African and South American ethnic groups no association was found (Gao et al. 2010). These findings were supported by another meta-analysis that showed that BsmI gene polymorphism (its recessive allele) decreases the risk of tuberculosis only in Asians (Wu et al. 2013).

Genes SCL11A1 and IL10 (both of them code proteins involved in immune response) might be predictors of genetic susceptibility to tuberculosis, (Fitness et al. 2004) as well as the polymorphism of gene +874 A/T (it codes interferon-γ production) (de Albuquerque et al. 2012).
In general, at present the possible explanation of genetic predisposition towards tuberculosis is the variation of genes involved in immune response.

2.9 Disease prevention
Prevention of tuberculosis in population is based on the reduction of risk factors. It can be done by means of transmission control and measures against progression of the disease to the active form. The measures are divided into specific and nonspecific. The former influence on the cause, whereas the latter are developed in order to control factors that indirectly influence on the disease progression (Figure 6) (World Health Organization 2008b). Vaccination is a measure to prevent disease transmission and protect people against disease, but in case of tuberculosis the only available nowadays Bacillus Calmette-Guerin (BCG) vaccine does not meet these criteria completely.

![Diagram of tuberculosis prevention](image)

Figure 6. Scheme of the ways of tuberculosis prevention (adapted from “Implementing the Stop TB Strategy. A handbook for national tuberculosis control programmes” by WHO) (World Health Organization 2008b).

2.10 BCG vaccination
Bacillus Calmette- Guerin vaccination is one of the oldest vaccines among used nowadays. BCG is live weakened *M. bovis* strain, and its substrains differ among laboratories where vaccine is manufactured (World Health Organization 2013c). Since the introduction of the
vaccine in 1921, its effectiveness has been arguable. It is proved that BCG has protective effect against meningitis and disseminated TB in children (World Health Organization 2004), but the risk of tuberculosis development after vaccination is reduced by 50% (Brewer 2000). Moreover, the vaccine trials showed its different efficacy in different geographic areas. It seems that BCG performs better in northern countries (North America and Northern Europe), whereas the protective effect diminishes closer to the equator in southern regions. The possible explanations are the difference in the designs of trials and vaccine substrains used in the studies. Another suggestion is that environmental *Mycobacterium* may influence on vaccine induced immunity (before or after BCG administration) and this interference differs between individuals living in cold and hot climate (World Health Organization 2004).

Controversial effectiveness of BCG and growing number of people infected with multidrug-resistant TB and extensively drug-resistant TB strains cause the need for better vaccine. There are several possible candidates (new vaccines or boosters of BCG), but the best candidate, the booster of BCG vaccine, did not prove its efficacy in the recent randomized control trial (Tameris et al. 2013), so BCG seems to be the only one available preventive tool against the disease in the nearest future.

BCG has some nonspecific effects, which are in the scope of interest. They are possible interaction of BCG vaccination with allergy development in children (Arnoldussen et al. 2011) and potential reduction of infant mortality in low birth weight children associated with vaccine administration (Biering-Sørensen et al. 2012). In clinical practice BCG is used as intravesical immunotherapy drug in the treatment of non-muscle-invasive bladder cancer (Babjuk et al. 2013).

**2.11 WHO guidelines on BCG vaccination**

BCG is recommended by the WHO as the disease prevention tool. According to the guidelines, BCG vaccine should be given to all newborns just after birth in the countries with high burden of the disease (World Health Organization 2004). In Finnish guidelines high burden country is a country where tuberculosis incidence is equal or higher than 50 per 100 000 (Terveyden ja Hyvinvoinnin Laitos 2013). Also, the vaccine should be given to the children at the risk of TB exposure in low-incidence settings and to people exposed to MDRTB. The vaccine is contraindicated during pregnancy and for the
individuals who suffer from immunodeficiency of different origin (including HIV infection) (World Health Organization 2004).

The vaccination of HIV infected newborns and those who are suspected to have HIV is a separate concern. It is recommended to immunize the newborns whose mother has unknown HIV status or HIV infected mother, but the child does not have symptoms of HIV infection. However, the decision can be done after taking into consideration other factors such as prevalence of TB and HIV in the population, possible risk for children to be infected with TB and HIV, local prevention capacity of mother to child transmission, follow up and diagnostics opportunities. The immunization is contraindicated for those newborns who have confirmed HIV infection with or without symptoms, and for those who have symptoms of HIV infection but have unknown HIV status and were born to HIV positive women (World Health Organization 2007a).

In general, BCG is rather safe and can be administered with other vaccines. Adverse effects of BCG are rare, and most common are local ulceration and regional lymphadenitis (the frequency for both is less than 1 case in 1 000 vaccinations). Osteitis induced by vaccination is observed even less frequently (World Health Organization 2004).

In many Western countries TB is not endemic disease anymore and is rare in population, so BCG vaccine is supposed to be not essential in such settings. The World Health Organization recommends the shift towards selective BCG vaccination in the countries meeting one of the next criteria: notification rate of smear-positive pulmonary TB is less than 5 per 100 000 per year; or the cumulative notification rate of tuberculous meningitis among children under five years old during five previous years is below 1 per 10 million; or the risk of TB is less than 0.1% per year (World Health Organization 2004).

In some countries the change of vaccination policy was connected to the alteration of the disease epidemiology to some extent. Sweden shifted towards selective immunization programme in 1975. The analysis of the epidemiological situation, followed after the policy change, showed that the increase in TB incidence was observed in children born to foreign parents, while in children born to Swedish parents indicators were within the expected trends. The situation was improved by means of intensifying selective vaccination programme (Romanius et al. 1992). In France the change of BCG vaccination policy from compulsory to selective took place in 2007. The assessment of the effectiveness of new practice showed that from 2006 to 2009 there was no increase in
tuberculosis cases among children, however, the coverage of vaccination among children adhering to the risk groups was insufficient. Mainly children served in private sector experienced the lack of vaccination and the observation can be explained by low awareness of medical professionals about inclusion criteria in the risk group (Guthmann et al. 2011).

2.12 BCG immunization programme in Finland

In Finland compulsory BCG vaccination in children was shifted to selective in 2006. The decision was done due to several reasons: low incidence and prevalence of TB in Finland and increase in the number of adverse effects (Rapola 2007). The first reason is the common trend in TB for all Nordic countries that was described previously. The second reason was a dramatic increase in the number of adverse effects as the result of the vaccine strain change utilized for the mass immunization in Finland. After the change of Glaxo-Evans strain (the strain was withdrawn by the manufacturer) to Denmark’s Statens Serum Institut (SSI) strain the incidence of BCG induced inguinal lymphadenitis had risen from 8 per 100 000 to 285 per 100 000, and the slight increase in the incidence of BCG osteitis was observed (Salo 2006).

At present, it is recommended to give vaccine to the high-risk group that includes children whose relatives (mother, father, siblings) or the person with whom child lives was diagnosed with TB; or if the child, his parents, or one of the parents, the person with whom the child lives was born in the country with high TB incidence (more than 50 in 100 000 per year). Also, the child who is going to live in a high TB incidence country for more than one month during his/ her first year of life should be vaccinated with BCG (Rapola 2007). The child who does not belong to the risk group can receive vaccine if the parents request for it and no contraindications were revealed. Similar to the statement in the WHO recommendations for vaccinations, the contraindication is immunodeficiency including HIV. Newborn, whose mother is infected with HIV, is offered vaccine only after test and confirmation not to have been infected with virus. Another restriction is severe combined immune deficiency (SCID), but the disease cannot be diagnosed at birth and its incidence is very low (Salo 2006). Low birth weight, which is set as less than 2,500 kg is a restriction for BCG as well (Terveyden ja Hyvinvoinnin Laitos 2013).

According to the information obtained from the manager of Maternity Ward, Kuopio University Hospital and from the nurse at the Infectious Disease Health Care
Department of the city of Kuopio, all children for whom BCG vaccine is indicated receive vaccine (Sari Vatanen, 2012; Mustonen Jaana, 2012).

So far, the monitoring has not revealed any change of TB epidemiological situation in the country connected to the change in vaccination policy (Jaakola et al. 2012).

2.13 Tuberculosis among immigrants

The increase in the proportion of tuberculosis cases among immigrants in developed countries, where the disease is not endemic any more (European Centre for Disease Prevention and Control/ WHO Regional Office for Europe 2013), causes some concern in Western society about possible reoccurrence of tuberculosis due to immigration (Ämmälä 2010).

In the European WHO region some countries implement TB screening among immigrants based on either country of origin (take into account incidence rate or geographical location (as ex-Soviet Union countries)) or status of immigrants on arrival (screening among asylum seekers), or both. Screening is mainly voluntary process and done by means of chest X ray, TST, or IGRA. According to the review by Bothamley et al. done in 2008, in Finland screening for TB is provided among contacts of sputum smear- positive pulmonary TB person and is done among asylum seekers and immigrants from the former Soviet Union countries (Bothamley et al. 2008). The highest rate of tuberculosis among immigrants during the first year after arrival can be explained by the implementation of screening programmes. However, the risk of tuberculosis persists much longer, and even after seven years post immigration resettles still have risk to be diagnosed with TB. Moreover, in people originating from Asia and Africa extrapulmonary TB can occur in a long period after immigration (Farah et al. 2005). So what are the special risk factors that make immigrants to be more prone to tuberculosis even after a long time after arrival?

2.13.1 Socio-economic factors and tuberculosis among immigrants

As US study shows, people born outside the United States have six times higher rates of tuberculosis compared with people born in the country. The risk for immigrants was higher at all four levels of socio-economic status defined by means of such indicators as education, crowding, income, and unemployment (Olson et al. 2012). The socio-economic and cultural difference that might persist between immigrants and local population explains the difference in tuberculosis patients. Those who suffer from TB and have a history of immigration are more often live in crowded flats, are younger but have lower
rates of smoking and alcohol consumption compared with local cases. In this research the
difference might be explained by traditions and culture as the largest proportion of
immigrants was from Romania, Pakistan, African countries (Morocco, Senegal), and Latin
America (Bolivia, Ecuador, Columbia and Peru). Moreover, according to the opinion of
physician in charge, immigrant TB patients do not completely understand their disease and
implemented therapy. The latter can seriously influence on tuberculosis treatment process,
outcome, and transmission in population (García-García et al. 2011). The fear to be
departed from the country and fear of stigmatization was defined as the main obstacle for
Somalia immigrants in Sweden for visiting health care facilities and concealing some
information on their health status (Kulane et al. 2010). The misconception about
tuberculosis transmission and the curability of the disease, as well as opinion that there is a
negative attitude towards TB patients in society, prevail mostly among foreign born people
(Wieland et al. 2012).

2.13.2 Transmission of TB among immigrants
Immigrant subpopulation has different pattern of tuberculosis dynamics. Indeed,
transmission of TB is more frequent among people within a community defined by the
country of origin (Rodwell et al. 2012). The tuberculosis outbreak in Sweden among
schoolchildren revealed that local born children whose parents are immigrants from high
incidence countries have higher risk to be diagnosed with both active and latent forms of
tuberculosis. It can be so that there is a reservoir of the infection in immigrants’
community, and travel to the parents’ home country might increase the exposure to the
Mycobacterium among the children (Muller et al. 2008). The history of immigration is one
of the risk factors for TB diagnostics delay that in turn increases chances of the disease to
spread among immigrants (Storla et al. 2008).

Danish study refuted the opinion that the infection can be transmitted from immigrants to
the local population. Vice a versa according to the study, migrants have a higher
probability to get the infection from Danes. The similar picture is likely to be observed in
other low incidence countries (Kamper-Jørgensen et al. 2012).

2.13.3 Features of clinical manifestation of TB in immigrants
Clinical manifestation of the disease also differs in the representatives of the
subpopulation. Extrapulmonary tuberculosis is more frequent among immigrants
(European Centre for Disease Prevention and Control/ WHO Regional Office for Europe
2013). In the study conducted in the United Kingdom such rare for developed countries condition as tuberculosis during pregnancy was observed only among nonwhite immigrant women recently arrived in the UK (median time after arrival was 4.5 years). All patients except one were born outside the country; again a half of cases had extrapulmonary location (Knight et al. 2009). In European countries among cases of foreign origin extrapulmonary TB accounted for 38% while for local cases this proportion was 17%. The most common locations of extrapulmonary TB in foreigners were disseminated TB, lymphatic TB, gastrointestinal TB, and bone TB. Local cases of extrapulmonary TB were more likely to be diagnosed with meningitis, urogenital TB, and pleural form of the disease. (European Centre for Disease Prevention and Control/ WHO Regional Office for Europe 2013).

2.13.4 Country of origin and tuberculosis in immigrants

Immigrants are not the representative sample of the population of their homeland. The analysis and comparison of data from the US National Tuberculosis Surveillance System (NTSS) and the statistics from the Global Project on Anti- Tuberculosis Drug Resistance Surveillance (Global DRS) demonstrated that correlation between Global DRS and both isoniazid resistance and MDR- tuberculosis cases from NTSS is weak. However, correlation was stronger for older NTSS reports and newer ones. The finding led to the conclusion that MDR-TB epidemiology among immigrants can be predicted better on the basis of previous epidemiological records in this subpopulation, than on the basis of data from the countries of immigrants’ origin. The knowledge can be useful in latent tuberculosis management in people born outside the country and may help health professionals to suspect drug resistance in immigrant TB patients (Taylor et al. 2012).

Finally, it is difficult to compare studies on immigrants conducted in different countries, as the population structure differs. For instance, while the highest rates of TB in the USA was observed among those who came from Vietnam, Philippines, India, China, and Mexico (Olson et al. 2012), in Norway the highest incidence of TB was among Somali, Pakistanis, Vietnamese and Yugoslavians (Farah et al. 2005). These are representatives of developing countries with a high burden of TB, but cultural and social traditions differ dramatically among these nationalities. A large-scale survey among immigrants diagnosed with tuberculosis showed that the region of origin is the predictor for both knowledge and perception of the disease. Other variables as education, income, age, visa status, place of diagnosis, BCG vaccination, and symptoms of tuberculosis were also associated with the
knowledge about TB. Age, TB symptoms, place of diagnosis, English language skills, duration of stay in host country, and shared household rooms were revealed as the predictors of perceived stigma and risk (Colson et al. 2013).

The listed factors complicate both study and health management among immigrants and the subpopulation demands a special approach.

2.14 Structure of immigrants in Finland

In 2012 big proportion (87%) of population growth in Finland was due to immigration. This trend has been observed from the beginning of 2000s. By the native language the highest proportion of immigrants is Russian speaking people, Estonians, immigrants from Somali, and persons whose mother tongue is English or Arabic (Official Statistics of Finland 2013). The number of foreign citizens from the next countries is highest (more than 2 000): Estonia (39 585), Russian Federation (30 177), Somalia (7 485), China (6 465), Thailand (6 027), Iraq (5 903), Turkey (4 282), India (4 029), United Kingdom (3 933), Germany (3 887), Vietnam (3 344), Poland (2 897), United states (2 759), Ukraine (2 515) (Population Information System. Population Register Centre 2012). By the country of birth the largest group is those who were born in Ex-Soviet Union, followed by Sweden and Estonia. In general foreigners born in Europe contribute more than a half of the total number of immigrants, then Asians (20.2%), Africans (9.1%), and the smallest groups are from America and Oceania/or unknown. Nowadays, according to the information of Statistics Finland, the main reasons for coming to Finland are “study”, “work”, and “family”. Number of asylum seekers has been falling during recent years and the trend observed in other Nordic countries as well. The majority of immigrants live in capital region. For instance, in 2011 the proportion of foreign nationals in Helsinki, Espoo, and Vantaa was 8%, 7.5%, and 7.3% respectively while in Kuopio this proportion was 1.9% (Ministry of the Interior 2012). According to the information obtained from Kuopio University Hospital, in 2011-2012 the approximate number of the newborns from immigrants’ families was about 40. The main countries of origin are Thailand, Russia, Burma, and African states (Sari Vatanen, 2012).

2. 15 Factors that influence on vaccination decision

2.15.1 Health belief model and vaccination decision

The health belief model describes main factors that influence on decision-making in individuals (Figure 7). According to the model, the set of “perceptions” and their
interaction define the decision about preventive activities. In the case of childhood vaccination, if parents feel that child can be infected with the disease and the consequences are serious, parents perceive the possible threat, evaluate benefits of vaccination (the reduction of the probability to get the infection) and barriers (possible tangible and intangible costs of the procedure). If benefits outweigh the costs, the decision will be to vaccinate the child. In the opposite case vaccination will be refused. Information obtained by parents from different sources, previous experience connected to the disease or vaccination, socio-economic, and cultural variables influence on the perception and play role in the decision formation (McKenzie & Smeltzer 1997, Healy & Zimmerman Jr. 2010).

![Health Belief Model](image)

Figure 7. Health Belief Model (adapted from ‘Planning, Implementing, and Evaluating Health Promotion Programs’ by McKenzie, James F., and Smeltzer, Jan L (McKenzie & Smeltzer 1997)).

2.15.2 Categories of parents defined by the attitude towards vaccination

The decision to vaccinate children is done by parents and in the settings when vaccine is not compulsory the role of parental opinion is crucial. Leask et al. divided parents into five categories according to their acceptance of vaccination.
The parents who belong to the first category “Unquestioning acceptor” (30 to 40 % out of total number) are characterized by having less detailed information about vaccination; they trust medical professional, want to vaccinate and vaccinate their children.

The members of the second group (25- 35%) are called “Cautious acceptor”. They have minor concerns about vaccination but vaccinate their children.

The third group is “Hesitant” (20- 30% of parents) who have significant concerns about vaccination but vaccinate their children. These parents are aware about vaccination risks and health professional should provide them with detailed information.

“Late or selective vaccinator” is the fourth group of parents consisting 2- 27% out of all parents. The parents in this group have significant concerns about vaccination, so they delay vaccination of their children or/ and immunize children with selected vaccines. These people tend to seek information about the issue and are informed well about vaccines. Health care provider should give comprehensive information about vaccination to this category of parents.

The last group is “Refuser” and they constitute less than 2% of parents. They refuse all vaccines because of religion, philosophical beliefs, distrust in medical community etc. Therefore, these parents tend to cluster in specific communities (Leask et al. 2012). Interestingly, the sources of information might depend on parental attitude .Study on rotavirus vaccination among children revealed that parents who did not vaccinate children more frequently used internet as a source of information about vaccine (Dube et al. 2012). It seems that vaccination opponents due to distrust tend to search information independently.

2.15.3 Barriers and obstacles for childhood vaccination
The obstacles for childhood vaccination are rather heterogeneous: from parental substance abuse (drug abuse) to the perception of vaccine as a source of threat for the children (Niederhauser & Markowitz 2007). The comprehensive systematic review done by Mills et al. indicated the main groups of obstacles for childhood vaccinations defined by the highlighted issue.

The first issue of “harm” includes the fear of adverse effects, concern that vaccine can cause disease, a previous negative experience of the vaccine, the belief that vaccine is given at a very young age and is painful for the child (Mills et al. 2005). In a survey
conducted in the USA, the concern about vaccination safety is a statistically significant predictor of parental attitudes towards vaccination that are characterized as “unsure about vaccination”, “delayed vaccination status”, and “refused”. The questionable vaccine for large proportion of respondents was varicella vaccine followed by the option “not a specific vaccine” (Gust et al. 2008).

The second group comprises “the distrust of the medical community”; rely on “alternative methods of protection” and “natural immunity”; opinion that “the disease is not a problem” and the vaccination is ineffective (Mills et al. 2005). It can be so that the level of trust in medical personnel has a significant contribution to the attitude towards vaccination among parents (Benin et al. 2006). In the study of Gust et al. the “information or assurance from the health care provider” was the main reason for the majority of parents to change their opinion about the delay or immunization refusal (Gust et al. 2008). There is high vaccination coverage among children whose parents had concern about the procedure, but health care provider influenced on the acceptance of vaccination. The group of vaccination staunch opponents, whose negative opinion is not changed by health care provider, mainly includes non-Hispanic white mothers with 12 years of education who live in a household with more than four children aged less than 18 years (Smith et al. 2006). In another study from the USA, parents who mainly had concerns about vaccination also adhered to non-Hispanic white population (Allred et al. 2005). The issue “rely on alternative methods”, which was highlighted in this group, was described in a study conducted in Haiti where mothers who used traditional healers’ service less likely vaccinated their children (Muula et al. 2009).

The next issue of “access” includes transportation costs, prices of the vaccination, lack of time; the need to wait for the appointment, unawareness of vaccination schedule, and poor communication with medical staff (Mills et al. 2005). Such barriers as transportation costs can explain the association between low income and opposition to vaccination (Kennedy et al. 2005). In the Haitian study the lack of vaccination among children was associated with the distance from the place of residence to the nearest health care facility longer than 60 minutes’ walk (Muula et al. 2009). In the case of noncompulsory vaccinations, especially if vaccine is relatively new and parents should pay for it, the barrier for immunization is the price of the procedure. However, parents’ intention to vaccinate their children is the main predictor of future vaccination (Dube et al. 2012). As it was mentioned, health care professional plays a significant role in the development of the attitude towards vaccination.
If communication between parents and medical staff is poor, the essential information cannot be provided, and the needed level of trust cannot be achieved.

Finally, there are “other” reasons of vaccination refusal: religion, moral views, and insufficient knowledge of disease (Mills et al. 2005). Religion is an important factor for vaccination opinion. For instance, in the Netherlands a small epidemic of vaccine-preventable disease were registered among people adhering to the orthodox Protestant minority. The study of this subgroup revealed that vaccination coverage among this group of population was about 60% (Ruijs et al. 2011).

2. 16 Factors influencing on vaccination in immigrants’ children

Few studies have been done on factors that influence vaccination among immigrants’ children and immunization barriers in this particular group of the population. To our knowledge, no studies have explored the attitude towards BCG vaccination among immigrant parents. Waldhoer et. al revealed that children of immigrant mothers had lower coverage of the recommended vaccines, but the countries of origin were not defined in this study (Waldhoer et al. 1997). According to the survey conducted in the Netherlands, parents of non-Western descent have more concerns regarding vaccination and adhere less to the National Immunization Programme. The main group in this study constituted of people of Turkish and Moroccan origin. Moreover, the comparison with the data obtained from the previous similar survey held 10 years ago showed that the number of parents who are “less incline to accept vaccination” had become higher (Mollema et al. 2012).

German findings suggest that the vaccination against hepatitis B and MMR (Measles, Mumps, and Rubella) among immigrants’ children may depend on education and acculturation of the parents. The higher level of parental education is associated with lacking of vaccination. On the contrary, the lower level of acculturation of parents was associated with the lower risk of vaccination absence and higher risk of the lack of vaccination. In the study the majority of immigrant parents were from former Soviet Union countries (Mikolajczyk et al. 2008).

Researchers explained the interaction between education and lack of vaccination by possible influence of anti-vaccination campaign in media (Mikolajczyk et al. 2008). The influence of media was investigated in recent study embraced world media publications on this topic. It was revealed that the majority of positive reports described “vaccine development and introduction”, “vaccine delivery programme”, “recommendations”, and
“contextual factors”. Negative articles were dedicated to “beliefs, “awareness, and perception”, “vaccine safety”, and “impacts on vaccine programmes and disease outbreaks”. In two (France and China) of five countries selected as example, vaccine against tuberculosis was discussed positively in the media (Larson et al. 2013).

2. 17 Key points after literature review.

1. While tuberculosis is still a global problem, the disease affects mainly people from developing countries and marginalized portions of population.

2. Microbiologic characteristics of *Mycobacterium* define the possibility of latent infection with the risk of disease reactivation a long time after infection.

3. The factors that provoke development of tuberculosis have negatively influence on immune system and weaken immune response in individuals. The majority of these risk factors are associated with unfavorable socio-economic conditions.

4. Tuberculosis is one of the most common infectious diseases among immigrants in developed states. Clinical presentation of the disease and its dynamics differ in this group of population compared to local cases: it can manifest over a long period of time after migration, travel to home country increases the risk of infection, disease affects young group of people, and the extrapulmonary localization of lesions is more frequent. Immigrants might meet obstacles in health care utilization, and, finally, due to lower socio-economic status immigrants usually are more prone to the disease risk factors.

5. BCG vaccination reduces the risk of tuberculosis development in average by 50%. However, it is the only one available vaccine against the disease so it is recommended by the WHO to be used in the high burden settings. In countries with low incidence rate, vaccination is selective and recommended only for the high-risk groups. In Finland vaccination is recommended for children whose parent(s) is from a high burden country.

6. Decision to vaccinate child depends on many factors including parental awareness of disease threat, parental attitude towards vaccination, and parental beliefs. Socio-economic factors as well as communication and the level of trust in health care provider play a significant role in proper understanding of the issue.

7. There is a lack of studies which addresses the attitude towards vaccination and disease in immigrants. The structure of immigrants in the countries of resettlement varies and it is difficult to generalize studies done in a particular country.
3 Objectives of the study

3.1 Overall objective
The overall objective of the study was to define socio-economic factors that are associated with mothers’ decision to vaccinate their child with BCG.

3.2 Specific objectives
Specific objectives of the study were

1. To explore the association between socio-economic characteristics of respondents and attitude towards BCG vaccination.
2. To study the association between socio-economic characteristics of respondents and their attitude towards tuberculosis.

4 Methodology

4.1 Study Area
Geographical area of the study is Kuopio, Eastern Finland.

4.2 Study population
Study subjects are mothers who gave birth in Finland after 2006 and for whose children BCG vaccination was recommended (mother or father of the child, or both parents are immigrants from a high burden country). The high burden countries are listed in the document (Vuorela 2013). For the study “immigrant” was defined as a person born outside Finland.

4.3 Study design
It is a cross sectional study using questionnaire survey as a data collection tool.

4.4 Study settings
The study was conducted among mothers who visited maternity and child health clinics (neuvola) for medical examination of their children. The clinics are a part of primary health care system and provide free of charge obligatory health service for pregnant women and children under school age. Nurses and physicians at neuvolas are responsible for the provision of information about BCG vaccination before childbirth. Thereafter parents give their consent on immunization. There are 14 neuvolas located in several districts in Kuopio, so each family has access to a particular clinic and is served by a

4.5 Questionnaire

The questionnaire was introduced in three languages: English, Finnish, and Russian. The structure of the questionnaire is based on health belief model variables (McKenzie & Smeltzer 1997). Prior to the survey the questionnaire was piloted among five representatives of the target population: two English speaking (one is native speaker, one is not native speaker), two Finnish speaking (both are not native speakers), and one Russian speaking (native speaker) immigrant mothers. We asked pilot group members to indicate unclear or confusing questions or response categories and check the time they spent on the completion of the questionnaire. We improved questionnaire according to the comments. The final version included 37 questions divided into four parts: “General questions” (age, origin of the respondent and the father of the child), “Socio-economic situation” (education, employment, knowledge of Finnish language), “Attitude towards tuberculosis and BCG vaccination” (knowledge about the disease and vaccination, questions about vaccination status of child/children), and “General questions” (the part included sensitive questions about income, religion and plans for future) (Attachment 1).

In order to evaluate respondents’ knowledge of Finnish language, we adopted the European Language Levels- Self Assessment Grid (Council of Europe: Common European Framework for languages (CEF)). In the questionnaire we used the information from the systematic review of qualitative studies on main vaccination barriers (Mills et al. 2005). The respondents were asked to evaluate the range of their yearly income, which was based upon information about average disposable income in Finland (Official Statistics of Finland (OSF)).

The majority of questions are multiple choice questions and questions with Likert-type rating scale. We chose this type of questions because of the time limit and language barrier for some respondents. The survey was conducted at health care centers during routine examination, so both nurses and parents had time limit for a visit. In addition for many respondents English or Finnish is not mother tongue and inclusion of open-ended questions might cause problems in the filling the questionnaires in.

Nurses were asked to give questionnaires to the target group and describe respondents who refuse to fill the form in (the country of origin of parents and the reason for refusal). Also,
we asked nurses to avoid interaction with the mothers while respondents fill the questionnaire.

In order to keep anonymity respondents were asked to put the questionnaire after completion into envelope and seal it.

The survey was conducted within three months (from March 2013 till the beginning of June 2013).

4.6 Statistical analysis
Data analysis was conducted using IBM® SPSS® Statistics Version 21. Exact Fisher’s Test was used to compare variables within categories. Significance level was set as p≤ 0.05.

4.7 Ethical clearance
Ethical permission was asked from the Ethical Committee of the University of Eastern Finland (Attachment 2). Permission on the survey conduction in maternal and children health clinics was received from local health authorities (Attachment 3). Each participant was provided with a fact sheet with description of the study, informed consent, and the instruction on the questionnaire filling. Filling the questionnaire in implies the permission of a respondent to use the data provided.

5 Results
Only 24 questionnaires were eligible for analysis. Response rate was 80 % (Figure 8).
5.1 Socio-demographic characteristics of the respondents; Description of the subjects

By the country of origin the majority of parents were from Russia and Finland (Figure 9).

The mean age of the respondents was 28.7 years old (Table 1). Average duration of respondents’ residency in Finland was 8.9 years (Table 2). The majority were married (79.2%); three fourths (18) of the respondents had one child; and only one mother had three children. For 79% (19) the last child’s age was one year or less (Table 3).

Finnish citizens and the respondents that had fixed-term residence permit numbered 33.3% each; the majority of the mothers were not planning to return to their home country while eight did not know about this in the future (Table 4).

Full time employed were 39.1% (9). The housewives totaled 34.8%. The remaining was on maternity leave or unemployed (total amount 6). More than half of the respondents stated both that their financial situation and the level of financial security was “Average” (69.9% and 62.5% respectively). The option indicating a poor financial situation was marked by one mother, while three mothers stated the level of security as “Low”. For 47.8%
disposable income for the family was less than 20,000 Euro per year. Three women evaluated their income as “more than 50,000” Euros (Table 5).

The level of Finnish language for many (25%) was “Basic”. Only one indicated the option “Cannot speak Finnish but want to learn”. One fourth of the respondents were native speakers, the others, who evaluated their language level as “Lower intermediate” and “Intermediate”, consisted of 12.5% each. The majority of women watched Finnish TV more than two times per week (58.3%), while 20.8% (5 persons) did not watch Finnish television. The same number of respondents never read Finnish newspapers. Less than a half (37.5%) read local newspapers once or twice a week. Three fourths of the mothers had a friend of Finnish origin (Table 6).

The religious views of the respondents were rather heterogeneous. Women mentioned the adherence to such religions as Christianity, Orthodox, Islam, Buddhism, and Lutheranism. About one third adhered to the Orthodox Church (33.3%), four just said that they were Christians, and four persons were Lutherans. Six of the respondents stated that they did not adhere to any religion (the information is not included into the tables).

![Countries of origin](image)

Figure 9. Distribution of the countries of origin among the respondents
Table 1. Respondents’ age (n= 23)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean value</th>
<th>Median value</th>
<th>Maximum value</th>
<th>Minimum value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>28.7</td>
<td>29</td>
<td>39</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 2. Duration of residency in Finland (n= 24)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean value</th>
<th>Median value</th>
<th>Maximum value</th>
<th>Minimum value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of residency in Finland (in years)</td>
<td>8.9</td>
<td>4</td>
<td>30</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3. Family characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents’ marital status (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>19</td>
<td>79.2</td>
</tr>
<tr>
<td>Divorced</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Cohabitation</td>
<td>2</td>
<td>8.3</td>
</tr>
<tr>
<td>Single</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Number of children in family (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>18</td>
<td>75</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>20.8</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Age of the last child (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 year or less</td>
<td>19</td>
<td>79.2</td>
</tr>
<tr>
<td>from 1 to 2 years</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>more than 2 years</td>
<td>2</td>
<td>8.3</td>
</tr>
</tbody>
</table>
Table 4. Characteristics of the respondents’ residence status

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents’ type of residence permit (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A (fixed-term residence permit)</td>
<td>8</td>
<td>33.3</td>
</tr>
<tr>
<td>B (temporary residence permit)</td>
<td>2</td>
<td>8.3</td>
</tr>
<tr>
<td>P (permanent residence permit)</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Finnish citizenship</td>
<td>8</td>
<td>33.3</td>
</tr>
<tr>
<td>Intention of respondents to move back to home country (n= 21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was going to return to home country</td>
<td>2</td>
<td>9.5</td>
</tr>
<tr>
<td>Was not going to return to home country</td>
<td>11</td>
<td>52.4</td>
</tr>
<tr>
<td>Did not know</td>
<td>8</td>
<td>38.1</td>
</tr>
</tbody>
</table>

Table 5. Respondents’ socio-economic situation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents’ education (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Vocational school</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>College</td>
<td>4</td>
<td>16.7</td>
</tr>
<tr>
<td>University</td>
<td>13</td>
<td>54.2</td>
</tr>
<tr>
<td>PhD</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>Respondents’ employment status (n= 23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full time employment</td>
<td>9</td>
<td>39.1</td>
</tr>
<tr>
<td>Unemployed</td>
<td>4</td>
<td>17.4</td>
</tr>
<tr>
<td>Housewife</td>
<td>8</td>
<td>34.8</td>
</tr>
<tr>
<td>Maternity leave</td>
<td>2</td>
<td>8.7</td>
</tr>
<tr>
<td>Evaluation of financial situation (n= 23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 (bad)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>4.3</td>
</tr>
<tr>
<td>2 (average)</td>
<td>16</td>
<td>69.6</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>21.7</td>
</tr>
<tr>
<td>4 (Excellent)</td>
<td>1</td>
<td>4.3</td>
</tr>
<tr>
<td>The level of financial security of respondents’ family (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>0 (A lot of money problems)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>2 (Average)</td>
<td>15</td>
<td>62.5</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>16.7</td>
</tr>
<tr>
<td>4 (Wholly secure)</td>
<td>2</td>
<td>8.3</td>
</tr>
<tr>
<td>Disposable income of respondents’ family (n= 23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 10 000</td>
<td>5</td>
<td>21.7</td>
</tr>
<tr>
<td>10 000 - 20 000</td>
<td>6</td>
<td>26.1</td>
</tr>
<tr>
<td>20 000 - 30 000</td>
<td>4</td>
<td>17.4</td>
</tr>
<tr>
<td>30 000 - 40 000</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>40 000 - 50 000</td>
<td>2</td>
<td>8.7</td>
</tr>
<tr>
<td>More than 50 000</td>
<td>3</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 6. Respondents’ Finnish language knowledge and the possible sources of information

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents’ level of Finnish language knowledge (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cannot speak but want to learn</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Basic</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Lower intermediate</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>Intermediate</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>Upper Intermediate</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Advanced</td>
<td>4</td>
<td>16.7</td>
</tr>
<tr>
<td>Native speaker</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Frequency with which respondents watched Finnish TV (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>5</td>
<td>20.8</td>
</tr>
<tr>
<td>Once in a month</td>
<td>2</td>
<td>8.3</td>
</tr>
<tr>
<td>Once in a week</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>More than two time in a week</td>
<td>14</td>
<td>58.3</td>
</tr>
<tr>
<td>Frequency with which respondents read Finnish newspapers (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>5</td>
<td>20.8</td>
</tr>
<tr>
<td>Frequency</td>
<td>Percentage</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>Once in a month</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Once in a week</td>
<td>9</td>
<td>37.5</td>
</tr>
<tr>
<td>More than two time in a week</td>
<td>9</td>
<td>37.5</td>
</tr>
</tbody>
</table>

Presence of a person of Finnish origin in the circle of respondents’ friends (n= 24)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Have a Finnish friend</td>
<td>18</td>
</tr>
<tr>
<td>Do not have a Finnish friend</td>
<td>6</td>
</tr>
</tbody>
</table>

5.2. Respondents’ knowledge and attitude towards tuberculosis and BCG vaccination

Vast majority of mothers (22) stated that they knew about the disease tuberculosis. More than 60% (17) marked the answers reflecting negative social attitude towards TB patients. Five respondents believed that the attitude towards TB patients was the same as towards other members of society. Two women marked the answer “Other” in the question “How people perceive TB patients” with the following remarks “They afraid to be infected” and “Did not noticed in Finland”. Less than a half (41.5 %) felt risk for their health if they met a person with TB, and almost the same amount (45.8%) had never thought about this issue. Eleven mothers responded about the possibility for their children to be infected with TB “Do not know” (45.8%), seven mothers (29.2%) thought that it was possible, and six (25%) rejected the possibility for their children to get the infection. Half of the respondents stated that it was impossible to be infected with TB in Finland. The knowledge about the protection against tuberculosis was stated by 15 women. Three fourths of the respondents did not know someone with tuberculosis, and 26.1% (6 people) had had an experience of communication with a person suffered from TB. Twelve of those who adhered to a religion did not know the attitude of their religion concerning vaccination, whereas the remaining six believed that their religion supported vaccination (Table 7).

All respondents knew about BCG vaccination, and all respondents except one vaccinated their children. The reason for not vaccinating for this single case was medical reason (low birth weight), and the child would be vaccinated soon. Some mothers who vaccinated their children also marked possible reasons against vaccination and the answers were “Vaccination is a painful procedure”, “It causes complications”, “It is given in a too young age”, “Child should acquire a natural immunity”, and “I have bad experience or adverse effect after BCG vaccination in my relatives/ friends/ my previous children”. Decision makers on BCG vaccination in almost all cases (19 (79.2%)) were both parents of the child. Among mothers of several children (total amount was six) four mothers (66.7%)
stated that all their children received BCG vaccine, and two respondents indicated that not all children were vaccinated. According to the opinion of the majority (18 respondents), BCG vaccine is more useful than dangerous. The majority (79.2%) would pay for vaccine if needed. To the answer on the question “If you have to pay for vaccination against tuberculosis (BCG vaccination) would you vaccinate your child?” two respondents added “It depends on price” and “If it is recommended”. More than half of the respondents would vaccinate their child independently if vaccine were not provided in hospital. For the majority of mothers the information about vaccine provided by medical staff was complete and clear, whereas a quarter indicated that the quality of information was not sufficient. In 18 cases information obtained from medical professional did not change the opinion on vaccination (Table 8).

Table 7. Respondents’ knowledge about tuberculosis and attitude towards patients with tuberculosis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge about disease “tuberculosis” (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Know about tuberculosis</td>
<td>22</td>
<td>91.7</td>
</tr>
<tr>
<td>Do not know about tuberculosis</td>
<td>2</td>
<td>8.3</td>
</tr>
<tr>
<td>Opinion about social attitude towards TB patients (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral attitude as to other members of society</td>
<td>5</td>
<td>20.8</td>
</tr>
<tr>
<td>Negative attitude and alert to TB patients</td>
<td>10</td>
<td>41.7</td>
</tr>
<tr>
<td>Negative attitude and avoidance of TB patients</td>
<td>4</td>
<td>16.7</td>
</tr>
<tr>
<td>Negative attitude, both alert and avoidance</td>
<td>3</td>
<td>8.3</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>12.5</td>
</tr>
<tr>
<td>The description of respondents´ feelings towards a person with TB (n=24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feel risk for health</td>
<td>10</td>
<td>41.7</td>
</tr>
<tr>
<td>Do not feel risk for health</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>Do not know/ never thought about it</td>
<td>11</td>
<td>45.8</td>
</tr>
<tr>
<td>Opinion about the possibility for their child to be infected with tuberculosis (n=24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is possible</td>
<td>7</td>
<td>29.2</td>
</tr>
<tr>
<td>It is impossible</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Variable</td>
<td>Frequency</td>
<td>%</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-----------</td>
<td>-----</td>
</tr>
<tr>
<td>Opinion about the possibility to be infected with tuberculosis in Finland (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is possible</td>
<td>4</td>
<td>16.7</td>
</tr>
<tr>
<td>It is impossible</td>
<td>12</td>
<td>50</td>
</tr>
<tr>
<td>Do not know</td>
<td>8</td>
<td>33.3</td>
</tr>
<tr>
<td>Knowledge about protection against tuberculosis (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Know how to protect against TB</td>
<td>15</td>
<td>62.5</td>
</tr>
<tr>
<td>Do not know how to protect against TB</td>
<td>9</td>
<td>37.5</td>
</tr>
<tr>
<td>Acquaintance with someone who has/ had tuberculosis (n= 23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Know a person with TB</td>
<td>6</td>
<td>26.1</td>
</tr>
<tr>
<td>Do not know a person with TB</td>
<td>17</td>
<td>73.9</td>
</tr>
</tbody>
</table>

Table 8. Respondents’ knowledge and attitude towards BCG vaccination.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge about vaccination against tuberculosis (BCG vaccination) (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Know about BCG</td>
<td>24</td>
<td>100</td>
</tr>
<tr>
<td>Do not know about vaccination</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Opinion about vaccination against tuberculosis (BCG vaccination) (n= 23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 (more dangerous than useful)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 (do not know)</td>
<td>2</td>
<td>8.7</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>4 (more useful than dangerous)</td>
<td>18</td>
<td>78.3</td>
</tr>
<tr>
<td>BCG vaccination status of respondents´ children (for mothers of several children) (n= 6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All children are vaccinated</td>
<td>4</td>
<td>66.7</td>
</tr>
<tr>
<td>Not all children are vaccinated</td>
<td>2</td>
<td>33.3</td>
</tr>
<tr>
<td>BCG vaccination status of the last respondents´ child (n= 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child is vaccinated with BCG</td>
<td>21</td>
<td>87.5</td>
</tr>
</tbody>
</table>
Table 1:

<table>
<thead>
<tr>
<th>Decision makers on BCG vaccination of the last child (n=24)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother of the child</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>Mother and father of the child</td>
<td>19</td>
<td>79.2</td>
</tr>
<tr>
<td>Doctor</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Nurse</td>
<td>1</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Table 2:

<table>
<thead>
<tr>
<th>Readiness to pay for BCG vaccination if needed (n=24)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Would pay for BCG vaccination</td>
<td>19</td>
<td>79.2</td>
</tr>
<tr>
<td>Never thought about it</td>
<td>5</td>
<td>20.8</td>
</tr>
</tbody>
</table>

Table 3:

<table>
<thead>
<tr>
<th>Readiness to vaccinate the child independently, if BCG vaccination would not be provided (n=24)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Would vaccinate the child independently</td>
<td>15</td>
<td>62.5</td>
</tr>
<tr>
<td>Would not vaccinate the child independently</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>Never thought about it</td>
<td>6</td>
<td>25</td>
</tr>
</tbody>
</table>

Table 4:

<table>
<thead>
<tr>
<th>Opinion about the quality of information on BCG vaccination given by medical staff (n=22)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Given information was complete and clear</td>
<td>16</td>
<td>72.7</td>
</tr>
<tr>
<td>Given information was not complete and clear</td>
<td>6</td>
<td>27.3</td>
</tr>
</tbody>
</table>

Table 5:

<table>
<thead>
<tr>
<th>The influence of information provided by medical staff on respondents’ opinion about BCG vaccination (n=24)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Information changed opinion</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>Information did not change opinion</td>
<td>18</td>
<td>75</td>
</tr>
<tr>
<td>Do not know</td>
<td>3</td>
<td>12.5</td>
</tr>
</tbody>
</table>

5.3 Association between variables describing socio-economic characteristics of the respondents and the attitude towards tuberculosis and BCG vaccination

Statistically significant results were revealed in respect to the interaction between some variables describing the socio-economic situation of the respondents and the variables reflecting attitude of the respondents towards BCG and tuberculosis. Fisher’s exact test was used.

The level of mothers’ education as “University degree” or higher (PhD) was associated with the readiness to vaccinate the child independently compared with the women with lower education level (p-value 0.021) (Table 9).
The respondents who would pay for vaccination if needed compared with the group of mothers who never thought about the issue are more likely had average (or less) level of income (p-value 0.08) (Table 10).

Among the respondents who indicated their level of Finnish language knowledge as “Cannot speak”, “Basic”, or “Native speaker” no one declared that the information on BCG provided by medical staff was unclear or incomplete, whereas all mothers who stated that information was not sufficient the language level ranged from “Lower intermediate” to “Advanced” (p-value 0.034) (Table 11).

The respondents who read Finnish newspapers “Once a week” or “More than two times a week” more likely believed that getting TB in Finland was impossible, while those who did not read local newspapers at all mainly marked the option “I do not know” (p-value 0.001) (Table 12). The women who were not going to return to their home country also tended to reject the possibility of getting the disease in Finland (p-value 0.005) (Table 13).

Finally, among the respondents who were in acquaintance with a person suffered from tuberculosis more than a half described the feeling towards TB patient as “Feel risk for my health”. Whereas in the group of people who had not had such experience the most frequent answer was “Do not know/ never thought about it” (p-value 0.028) (Table 14).
Table 9. Association between respondents’ education level and readiness to vaccinate the child independently, if BCG vaccination would not be provided

<table>
<thead>
<tr>
<th>Variable 1</th>
<th>Variable 2</th>
<th>Total</th>
<th>p-value&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s education</td>
<td>Readiness to vaccinate the child independently if BCG vaccination would not be provided</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Would vaccinate the child independently</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Would not vaccinate the child independently</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Never thought about it</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School, vocational school</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>or college</td>
<td>13</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>University degree</td>
<td>16</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>or PhD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number</td>
<td>15</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

<sup>1</sup> Fisher’s exact test

Table 10. Association between the level of financial situation of the respondents and readiness to pay for BCG vaccination if needed

<table>
<thead>
<tr>
<th>Variable 1</th>
<th>Variable 2</th>
<th>Total</th>
<th>p-value&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial situation&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Readiness to pay for BCG vaccination if needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Would pay for BCG vaccination</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Never thought about it</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average or less than average</td>
<td>16</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>Better than average</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Total number</td>
<td>18</td>
<td>5</td>
<td>23</td>
</tr>
</tbody>
</table>

<sup>1</sup> Fisher’s exact test, <sup>2</sup> Financial situation were asked to be evaluated from 0 to 4, where 0 was marked as “bad”, 2 as “average”, and 4 as “excellent”.
Table 11. The association between respondents’ level of Finnish language and respondents’ opinion about the quality of information on BCG vaccination given by medical staff

<table>
<thead>
<tr>
<th>Variable 1</th>
<th>Variable 2</th>
<th>Total</th>
<th>p-value¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>The level of Finnish language knowledge</td>
<td>Opinion about the quality of information on BCG vaccination given by medical staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Given information was complete and clear</td>
<td>Given information was not complete and clear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cannot speak but want to learn</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Basic</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Lower intermediate</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Intermediate</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Upper Intermediate</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Advanced</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Native speaker</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Total number</td>
<td>16</td>
<td>6</td>
<td>22</td>
</tr>
</tbody>
</table>

¹ Fisher’s exact test

Table 12. The association between the frequency of reading Finnish newspapers among the respondents and respondents’ opinion about the possibility to be infected with tuberculosis in Finland

<table>
<thead>
<tr>
<th>Variable 1</th>
<th>Variable 2</th>
<th>Total</th>
<th>p-value¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency respondents read</td>
<td>Opinion about the possibility to be infected with tuberculosis in Finland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finnish newspapers</td>
<td>It is possible</td>
<td>It is impossible</td>
<td>I do not know</td>
</tr>
<tr>
<td>Never</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>
Once in a month | 0 | 0 | 1 | 1
Once in a week | 1 | 6 | 2 | 9 | 0.001
More than two times in a week | 3 | 6 | 0 | 9
Total number | 4 | 12 | 8 | 24

1 Fisher’s exact test

Table 13. The association between respondents’ intention to move back to home country and respondents’ opinion about the possibility to be infected with tuberculosis in Finland

<table>
<thead>
<tr>
<th>Variable 1</th>
<th>Variable 2</th>
<th>Total</th>
<th>p-value^1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention of the respondents to move back to home country</td>
<td>Opinion about the possibility to be infected with tuberculosis in Finland</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>It is possible</td>
<td>It is impossible</td>
<td>I do not know</td>
</tr>
<tr>
<td>Is going to return to home country</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Is not going to return to home country</td>
<td>1</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Do not know</td>
<td>2</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Total number</td>
<td>3</td>
<td>10</td>
<td>8</td>
</tr>
</tbody>
</table>

1 Fisher’s exact test

Table 14. The association between respondents’ acquaintance with a person suffered from tuberculosis and the description of respondents’ feelings towards a person with TB

<table>
<thead>
<tr>
<th>Variable 1</th>
<th>Variable 2</th>
<th>Total</th>
<th>p-value^1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquaintance with someone who has/had tuberculosis</td>
<td>The description of the respondents feeling towards a person with TB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feel risk for health</td>
<td>Do not feel risk for health</td>
<td>Do not know/never thought about it</td>
</tr>
<tr>
<td>Knows a person with TB</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
6 Discussion
The small number of participants does not allow drawing a precise conclusion based on the results we got. The number of questionnaires we expected to receive was about 50 (according to the average number of deliveries among immigrants in Kuopio University Hospital numbered about 40 deliveries per year and the duration of the survey three months). However, total amount of respondents meeting inclusion criteria was 30 (including those who refused to participate in the survey). We can explain this small amount by the overall low number of immigrants in Kuopio, low number of representatives of target population, and respectively short duration of survey period. There might be a seasonal decrease in the amount of mothers attending the clinics (the survey was conducted during spring months). In addition, immigrant families can leave for their home country or resettle in another Finnish province.

The majority of the respondents in our sample originated from Russia. The representatives of this country are the one of the largest group of immigrants in Finland. As city of Kuopio attracts foreigners to work and study at the University of Eastern Finland and at the University of Applied Science Savonia, the majority of participants had a university degree. Due to this fact, our sample was prone to selection bias.

The age of the last child for the majority of respondents was one year or less. According to the schedule, a child should be seen by public health nurse once in a month during first three months after birth, so mothers with children aged less than one year, visit maternity and child clinics more often than mothers with older children. On the other hand, this group of mothers is less likely affected by the recall bias because of a short period of time since they had made the decision on vaccination. All mothers are entitled to visit the clinics and visits are compulsory, so selection bias at this level was minimal. Among several women who refused to fill the questionnaire in, the majority explained their decision by “language barrier” and “lack of time”.

<table>
<thead>
<tr>
<th>Does not know a person with TB</th>
<th>6</th>
<th>1</th>
<th>10</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number</td>
<td>10</td>
<td>3</td>
<td>10</td>
<td>23</td>
</tr>
</tbody>
</table>

1 Fisher’s exact test
It was notable that almost all of the respondents indicated that the decision to vaccinate the child was done by both parents. The fact shows that fathers gave their permission for BCG vaccination and were not against the vaccine.

Our finding that all children who had been recommended to receive BCG were vaccinated is consistent with the information obtained from medical staff. High acceptance and the absence of negative attitude towards BCG vaccination among respondents were probably due to the long history of the vaccine usage and respectively low proportion of adverse effects it provokes. However, the knowledge about the protective effect of BCG vaccination may vary and people might have some misconceptions about it (Colson et al. 2013). We could not define the knowledge on vaccine effectiveness in this survey. Despite more than a half of the respondents declared that they know how to protect against TB, we cannot evaluate the true of this knowledge. As the time for maternal visits is limited, we had to compose a short questionnaire. Therefore, we included general questions and questions that in our opinion could reflect the attitude towards the study subject.

The readiness to vaccinate the child independently, if vaccine were not offered by medical staff, and readiness to pay for vaccination if needed, might indicate the awareness of a person about the importance of a vaccine. Our results showed that mainly mothers with university degree or higher would provide BCG independently, if vaccine were not offered in hospital. The parents with income self-assessed as “average” were ready to pay for BCG if needed. As the majority of our respondents had a university degree or higher and stated the adherence to the group of people with average level of income, it is difficult to say that both these variables are defined predictors of a positive attitude and awareness of the importance of BCG vaccination. However, education of parents plays role in the perception of vaccines and probably people with higher level of education have more knowledge about tuberculosis and immunization. Moreover, there were no negative reports on BCG vaccine in media (Larson et al. 2013). Thus, more educated parents, who probably track news regularly, do not feel any threat for their children’s health associated with BCG vaccine.

Good communication between medical staff and parents is essential for proper understanding of procedure, evaluation of risks and benefits of vaccination. In case of immigrants, language barrier might be an obstacle preventing from proper interaction (Santiago, Maria da Conceicaao F. & Figueiredo 2013). In our survey native speakers or mothers who evaluated their language level as “basic” were satisfied with the information
on BCG vaccination provided by the medical staff. On the other hand, those who evaluated their language knowledge between these two extreme options were more likely to have some claims about the information. It can be partially explained by the observation that the latter tend to speak Finnish with medical personnel, but the topic is very specific to be explained to a person with incomplete knowledge of language. On the contrary, people with basic knowledge of Finnish language interact by means of interpreter or use English as a main language. It is important to remember that the estimation of the real level of language knowledge cannot be based on the self-assessed language skills.

Finland has low incidence of tuberculosis and the possibility to get infection is low. The questionnaire contained a question about the opinion of the respondents on the possibility of getting the disease in Finland. The respondents who read local newspapers at least once in a week and did not intend to return to their home country, more frequently answered that getting TB in Finland was impossible. On the other hand, just few replied that it is possible to be infected with TB, and the remaining hesitated to answer. These results might indicate that newspapers are a source of information on medical topics. People who are going to stay in Finland tend to be more interested in any kind of information (including health topics) about the country of resettlement.

The fear of TB patients and negative attitude towards them are still an urgent issue. Almost all respondents of our survey believed that negative attitude towards patients with tuberculosis prevailed in society. Moreover, women who had an experience on communication with TB patient felt more concern about their health in this situation. It can be a consequence of social attitude towards these patients in the society where these people had lived before migration (Jurčev-Savičević 2011, Dodor & Kelly 2009). Stigmatization of the patients suffering from TB is a serious obstacle interfering with treatment and communication with such patients.

At last, the low sample size limited us from stratification by the country of origin. However, the place of birth is easily obtained information and if there is some interaction between country of origin and attitude towards vaccination and tuberculosis this knowledge could be a useful tool for health professionals in communication with immigrants (Colson et al. 2013).


7 Conclusion and recommendations

According to the results, the majority of parents believed that BCG vaccination is more useful than dangerous. Parents with higher level of education and with level of income self-estimated as “average” had a positive attitude towards BCG vaccination. We would recommend nurses to provide mothers, who are not native speakers and tend to speak Finnish language, with additional information about the vaccine. The information should be in the language mother knows better (English or their native tongue) in order to avoid misunderstanding and dissatisfaction on communication with medical personnel. Local newspapers might be another possible way to distribute medical information among immigrant parents. Within the talk about the vaccine, some information about the disease and its treatment might be provided in order to diminish the level of negative attitude towards TB patients among parents.

Our survey was an attempt to understand the possible socio-economic factors that might influence on BCG vaccination decision among mothers for whose children the vaccination was recommended (children from immigrant families). The knowledge of the interacting factors might help medical staff to be more productive in communication with immigrant parents and overcome possible obstacles they may encounter. The limitation of the study is small sample size, so it is impossible to interpret the results without any doubt. However, some our results are consistent with finding from other studies. It would be useful to investigate further the credibility of findings of this survey in a study with higher number of participants. Therefore, future researches among immigrant subpopulation should take into account the small number of immigrants in Kuopio and respective homogeneity of this subpopulation (mainly students or employees at local universities). The study settings we chose (maternity and child health care clinics) and good level of interaction between the nurses and mothers help to overcome the possible selection bias. In order to get the sufficient amount of responses, the duration of the survey period should be expanded at least for a year.

Despite the number of immigrants in Finland and in Kuopio in particular is very small, the amount of people coming to Finland to live and work grows steadily. Health of the representatives of this group of population is an important topic in many Western countries, and soon it can become the truth for Finland as well. So, further researchers in this field are needed.
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Appendices

Appendix 1. Questionnaire (1/9)

Serial number #

Date:

1 About the study:

Dear respondent! At the University of Eastern Finland (Faculty of Health Sciences, Institute of Public Health and Clinical Nutrition) we are doing a research about your perception of vaccination. We want to know your social, economic and cultural conditions, and what you think about BCG vaccination (vaccination against tuberculosis). Our questionnaire will take approximately 7 minutes. Please answer some questions.

2 Informed consent:

Your participation is voluntary; you can deny filling in this questionnaire at any moment. Your name and identifying information will not be recorded in the questionnaire and your responses will be anonymous. Your answers are important to us. The study results will be reported as a master thesis and published in scientific journal. If you would like to get additional information concerning the study, please, contact researcher Yuliya Evdokimova (e-mail yulie@student.uef.fi) or Maria Semenova (maria2semenova@uef.fi).

3 Instructions to filling in questionnaire:

If you agree to participate in our study, please give trustworthy information and fill this form in with CAPITAL BLOCK letters or, if it is multiple choice questions, just circle the answer which is true for you.

Part I. In this part you are asked to answer some general questions.

I.1. Age __________

I.2. Where you were born? ______________________

I.3. Where father of your last child was born? ______________________

I.4. Was your child born in Finland? ______________________

0 Yes
1 No (what country?)____________________________________________________________

I.5. Marital status

0  married
1  divorced
2  cohabitation
3  single
4  other _____________________________

I.6. Type of residence permit

0  A (fixed-term residence permit)
1  B (temporary residence permit)
2  P (permanent residence permit)
3  P- EY (residence permit for the third-country nationals with long-term EC residence status)
4  Finish citizenship.

Part II. In this part you are asked to answer some questions regarding your socio-economic conditions.

II.1. Education

0  school
1  high school
2  vocational school
3  college
4  university
5  PhD
**II. 2** Are you employed?

0  yes, full-time job  
1  yes, part-time job  
2  no, I am unemployed  
3  no, I am a housewife

**II.3.** Are you able to communicate in Finnish? Choose the answer which is mostly appropriate to you.

0  I cannot speak Finnish and I do not want to learn it  
1  I cannot speak Finnish, but I would like to learn it.  
2  I can understand some Finnish words, when people speak slowly and clearly. I can read and understand basic words. I can ask simple questions if I need and tell where I am from and where I live. I can write simple note.  
3  I can understand basic phrases in everyday spoken language. I can read short notes on everyday topics (advertisements, menus, timetables). I can speak about everyday activities, but cannot support a conversation for a long time. I can describe my family, my house, everyday life. I can write a simple letter.  
4  I can understand clear speech related to my everyday life (school, job), can understand the main idea of TV or radio programme. I can understand texts with high frequency of everyday words and understand main points in personal letters. I can ask most of the questions and enter into simple conversation without preparation as well as I can discuss my feelings and express my opinion, retell a short story. I can write personal letters.  
5  I can understand news on TV, movies with standard language, lectures. I can read and understand articles and texts on contemporary topics. I can talk to native speakers and take active part in discussions without preparation on familiar to me topics. I can talk on issues within my interests and present a clear description of my opinion. I can write an essays, reports, and letters.
6. I can understand speech and TV/radio programmes without efforts. I can understand texts, articles on different topics. I can easily express my point of view and actively in social and professional conversations. I can write well-structured text on complex subjects and use appropriate style.

7. I completely understand spoken language and need some time to understand accents. I can read and understand all types of texts. I can easily take part in discussions, use idiomatic expressions. Even if I have some difficulties in oral expression I am able to overcome it. I can right complex letters, reviews, articles and use appropriate style.

II.4. How often do you watch Finnish TV (on TV set or internet)?

0. never
1. once in a month
2. once in a week
3. more than 2 times in a week

II.5. How often do you read Finnish newspapers?

0. never
1. once in a month
2. once in a week
3. more than 2 times in a week

II.6. Do you have a Finnish friend?

0. yes
1. no

III. In this part you are asked to answer some question about your attitude towards vaccination against tuberculosis (BCG vaccination).

III. 1. Do you know about disease tuberculosis?
Appendix 1 (5/9)

III. 2. How people in society regard TB (tuberculosis) patients? (You can choose more than one answer)

0  TB patients are perceived in the same way as other members of society

1  People think differently about TB patients. There is a negative attitude towards them in society.

2  People think that TB patients are dangerous and try to avoid them.

3  Other ____________________________

III.3. What do you feel if you come across (see, meet) a TB (tuberculosis) patients?

0  I feel risk for my health

1  I do not feel any risk for my health

2  I do not know/ never thought about it

III.4. Do you think it is possible for your child to be infected with tuberculosis?

0  yes

1  no

2  I do not know

III.5. Do you think it is possible to be infected with tuberculosis in Finland?

0  yes

1  no

2  I do not know

III.6. Do you know how to protect against tuberculosis?

0  yes
III.7. Do you know someone who have/ had tuberculosis?

0 yes

1 no

III.8. Do you know about vaccination against tuberculosis (BCG vaccination)?

0 yes

1 no

III.9. What do you think about vaccination against tuberculosis?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>More dangerous</td>
<td>do not know</td>
<td>More useful than</td>
<td></td>
<td></td>
</tr>
<tr>
<td>than useful</td>
<td>dangerous</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

III.10. How many children do you have? ____________

III.11. Indicate the age of your children and vaccination status

<table>
<thead>
<tr>
<th>Age</th>
<th>Vaccinated against tuberculosis (BCG vaccination) yes -0, no -1, do not remember -2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
III.12. Have you vaccinated your last child against tuberculosis (BCG vaccination)?

0  yes
1  no
2  I do not remember

III.13. Who made the decision on vaccination against tuberculosis (BCG vaccination)?

0  I did it alone
1  I and the father of the child together
2  Father of the child alone
3  Other ________________________________

III.14. If you have to pay for vaccination against tuberculosis (BCG vaccination) would you vaccinate your child?

0  yes
1  no
2  never thought about it

III.15. If vaccination against tuberculosis (BCG vaccination) was not offered for your child at hospital would you vaccinate your child against tuberculosis independently?

0  yes
1  no
2  never thought about it

III.16. If you did not vaccinated your last child born in Finland against tuberculosis (BCG vaccination) please answer why (you can chose more than one answer if needed)?

0  medical reasons (for example, child disease, low birth weight)
1  my family members were against BCG vaccination
Appendix 1 (8/9)

2 BCG vaccination causes disease
3 BCG vaccination causes complications
4 I have bad experience of adverse effect after BCG vaccination in my relatives/friends/my previous children.
5 BCG is given in too young age
6 BCG vaccination is a painful procedure
7 The disease is not a problem and there is no need to give BCG vaccination
8 BCG vaccination is ineffective
9 A child should get the natural immunity
10 There are alternative methods of protection against tuberculosis
11 I had communication problems with stuff
12 Religious views
13 Other __________________________________________________

III. 17. Do you think that information given by medical staff (nurse, doctor) on vaccination against tuberculosis (BCG vaccination) was complete and clear?

0 Yes
1 No

III. 18. Did the information from medical staff (nurse, doctor) change your opinion on vaccination against tuberculosis (BCG vaccination)?

0 Yes
1 No
2 I do not know

IV Please answer some general questions.
Appendix 1 (9/9)

IV.1. How long have you been living in Finland (in years) _______________

IV.2 How you can you evaluate your financial situation?

0 1 2 3 4
bad average excellent

IV.3 Is your family financially secure?

0 1 2 3 4
a lot of average wholly secure money problems

IV.4. What is the income of your family in a year (euro) after paying taxes?

0 1 2 3 4 5
less than 10 000- 20 000- 30 000- 40 000- more than 50 000
10 000 20 000 30 000 40 000 50 000

IV.5. What is your religious view? _______________________

IV.6. What does your religion say about vaccination?

0 It supports the vaccination
1 It rejects the vaccination
2 I do not know

IV.7. Are you going to move back to your home country?

0 yes
1 no
2 I do not know

Thank you for participation!
Appendix 2. Statement of the University of Eastern Finland Committee on Research Ethics (1/1)

Statement of the University of Eastern Finland Committee on Research Ethics

The University of Eastern Finland Committee on Research Ethics has evaluated the ethical aspects of the research plan “Perceptions of BCG vaccination: Study on immigrant parents in Eastern Finland” proposed by Maria Semenova, MD, MPH, PhD student and Yuliya Evdokimova, Master’s Degree in Public Health student. The evaluation was carried out in the Committee meeting held on 15 November 2012 on the basis of the documents presented to the Committee (research plan and its appendices).

The committee found that the research does not qualify for an ethical review on the grounds of the stated reason “Study will be conducted using questionnaire data”, and the fact that the study is conducted for a master’s thesis and there is no mention in the request about publishing the results in a scientific publication.

Joensuu  Kuopio
19 November 2012

Risto Turunen  Helena Suomalainen
Chair of the Committee  Secretary of the Committee
Professor  Planning officer
Appendix 3. Approval of the research by
Health Services Director of the city of Kuopio (1/3)

Approval of Research - "Perception of BCG vaccination; study on immigrant parents in Eastern Finland"

Selostus ja perustelu: Master Degree Student in Public Health and Clinical Nutrition, (Faculty of Health Sciences University of Eastern Finland) Yuliya Evdokimova has applied approval of research to conduct a small study involving questionnaires in child health care clinics in central Kuopio. The purpose of this study is to examine the perception of BCG vaccination among immigrants and their children in child health care centers in central Kuopio.

Decision: I give you permission to distribute the questionnaires at Child Health Care clinics in central Kuopio. We request you to send us one copy of the research to our free of charge.

Toinivallan peruste:
Operational regulation of Basic Security and Health Care Services 3.8.3 mom.
Health Services Director Matti Pietikäinen delegation decision 5.9.2011 / 84.

Kristiina Määä
Health Care Services Manager

Valmistelija
Kristiina Määä, puh. +358 017 866 803
etunimi.sukunimi(at)kuopio.fi

Lähtö
Lähte A Kuntalaisuusden okaisivastuunohje

Pahtospytätkirja

3.4.2013

Lupu- ja ilmoitusasial 2 § / 2013
Ote: Approval of Research - "Perception of BCG vaccination; study on immigrant parents in Eastern Finland"

Oteen ollenki todistaa, Kuopiossa 09. huhtikuuta 2013

Anne Wärtö
hallintopalveluksiteeri

Liitteet

Approval of Research - "Perception of BCG vaccination; study on immigrant parents in Eastern Finland"

Tiedolsianto

Pääös on lihetetty tiedolkse postiise 09.04.2013
Evdolimova Yuliya

Tiedoki

Kaupunginhallitus
Perustusvä- ja terveyslisautakunta
Terveydenhoitoyksikö Riiha Turunen

Nähtävänäolo

Lähte A kuntalain mukainen oikaisuvaatimusohje

Oikaisuvaatimusohje

Päättöken tyytymätön tai tehdä kirjallinen oikaisuvaatimukse.

Oikaisuvaatimuksesta saa tehda se, joska päättös on löydetetty tai jonka oikeuteen, velvollisuuteen tai etuun päättös vahvammin vaikutaa (asianosuisen, sekä kunnan jäsen.

Oikaisuvaatimuskirje

Perusturvaj- ja terveydenhuolto

Postiosoite:
PL 227
70101 KUPIO
Käyttöosoite
Tulliportinkatu 17 B
Puhelin
017 18 6113
Faksi
017 18 6004
Sähköposti
perusturvaj@kuopio.fi
Virta-aika
8.00 - 15.30

Oikaisuvaatimuksilta ja sen alkaminen

Oikaisuvaatimus on tehnyä 14 päivän kuluttua päättöken tiedoiksi saamista.

Kunnan jäsenen katsotaan saaneen päättöken tiedon, kun päättörin on otettu yleiseksi nähtäväksi. Asianosainen katsotaan saaneen päättöken tiedon, jollei muuta näytetä, seitsenä päivän kuluttua kirjeen lähettämisestä, saattaudutuksen osoittamana aikana tai erillisen tiedoiksi saamistaan tilanteen merkitykseä aikana.

Oikaisuvaatimuksen sisältö ja toimittaminen

Oikaisuvaatimuksilta on käytävänätä oikeus perustevien ja saa tehdä asiakirjatettavat.

Oikaisuvaatimuksen voi toimittaa myös telepohonia (faksina) tai sähköpostina. Sähköstä asiakirjaat ei tule toteutettavaksi asiakirjoituksella, jos asiakirjastaa on tiedetään tiedottajista, eikä asiakirjaan liitynytä tai oleva epäilyttävä asiakirjasta

Oikaisuvaatimus on mutuksenkkijän tai hänen valtuuttamaansa asiakirjan toimittettava viranomaisen päättöken suositeltavasti sähköpostina tai faksina mutta asiakirjasta on tiedetänyt, että toimintoinnissa on olemassa epäiltyjä asiakirjastoa.

Sähköisen viestin faksina tai sähköpostina) katsotaan saapuneen viranomaiselle sähköpostia, kun on viranomaisten käytettävissä vastaanottoavustajalla tai tietojärjestelmän sisä, että viestiä voidaan käsitellä.

Oikaisuvaatimus toimitetaan asia omalla vastuulla. Postilla asiakirjat on jätettävä niin ajoissa, että ne eivät rikottu ennen oikaisuvaatimusajan päätymisäätä.

Postiosoite
PL 227 | 70101 Kuopio
Käyttöosoite
Tulliportinkatu 17
Puhelin
017 18 6611
Faksi
017 18 6604
Sähköposti
perusturvaj@kuopio.fi
Virta-aika
8.00 - 15.30