

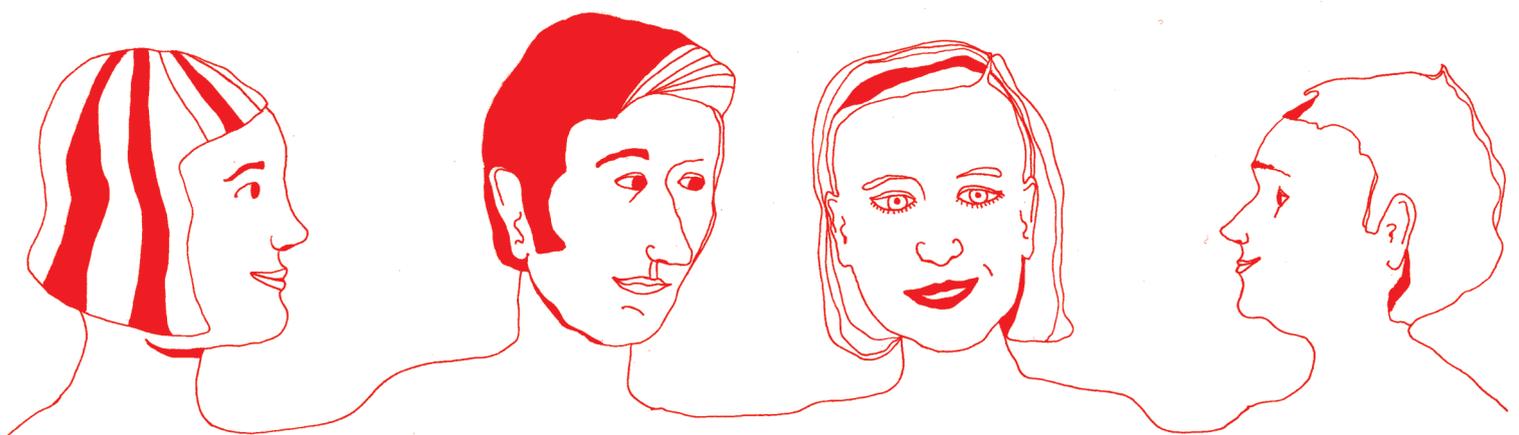
# Epidemiology and Treatment of Tuberculosis in Liepaja (Latvia) 1993-2002

Ingrīda Kužniece

Nordiska högskolan för folkhälsovetenskap

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– Essay –

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Author Ingrida Kužniece				
Author's position and address State Agency "Public Health Agency Liepaja Branch Veidenbauma street 11 LV -3401 , Liepaja Latvia				
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<p><b>Aim</b> To describe the epidemiology of tuberculosis in the city of Liepaja during the last 27 years and the management of patients with tuberculosis during the period 1993-2002; to identify problems in tuberculosis management relevant to increasing level of morbidity and the registered high levels of drug-resistance.</p> <p><b>Material and methods</b> The cases were all persons reported with tuberculosis in 1975-2002. The data sources were the yearly Health Statistics books at the Latvian Office of Medical Statistics. The study used data from the available 655 individual patient records from Liepaja Tuberculosis Dispensary and TB Register of 1993 – 2002. Information was extracted selectively and extraction sheets containing the variables of interest were developed. The incidence differences according to sex and age, possible clustering of patients in high-risk living areas of the city, differences in occupation of the patients were studied. The differences of time from disease symptoms to diagnosis, as well as investigation data, treatment regimens, the proportions of treatment outcomes were analysed. Analysis was done using EPI-INFO programme for statistical analysis.</p> <p><b>Results</b> In the 1980s tuberculosis was under control in Latvia and the incidence was at the European average level. After Latvia had regained independence in 1991, with economical and political disruption and changes in the health care system, TB incidence and mortality in the country increased rapidly as well as in Liepaja. Although not very high compared to global TB rates, there was great concern about TB control in Latvia. In addition, the emergence of drug resistance and multi-drug resistant bacteria made the TB epidemic more serious. The TB incidence increase in children suggested that there was quite a big number of undetected cases of TB. Tuberculosis control and early detection activities were not integrated into the PHC system. Treatment results of TB were quite poor and showed high proportions of interruptions, defaults, relapses. The tuberculosis control Programme in Latvia and Liepaja put much effort into the improvement of the epidemiological situation with TB, focusing on TB control activities and management during the period 1993-2002. The incidence of tuberculosis in Liepaja was higher than in Latvia, particularly in some living areas in the city, and above endemic level. Mortality rate in average was higher as in the whole country. The proportion of socially sensitive groups (children, unemployed, pensioners, disabled) comprised more than 50 % of the tuberculosis incidence. Incidence among medical staff was higher than in general population in the all professional groups. Medical delay of diagnosis decreased, but early detection of tuberculosis was not fully integrated in PHC system. There were quite big differences in numbers of MDR-TB in years 1993-2002. DOTS was introduced in Liepaja five years later than in Latvia –in year 2000 and strategy was not fully successful. The number of positive treatment outcomes increased, but the registered numbers of treatment relapses and defaults were higher than in Latvia .</p> <p><b>Conclusions</b> The situation with regard to tuberculosis development and tuberculosis management in Liepaja during the period under study was unfavourable. Particularly : the incidence and mortality rates, much variation in the diagnostic process, results of treatment ,a high proportion of MDR-TB , unsatisfactory links between local government, family doctors and medical professionals and multi-sectoral collaboration in TB control activities , the objectives set up by WHO for DOTS treatment were not reached .</p>				
Key words tuberculosis, incidence, mortality, fatality, delay in diagnosis, case management, DOTS, treatment outcome.				

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## **Abbreviations**

TB – tuberculosis

WHO – World Health Organization

NTP – National Tuberculosis Control Programme

MDR –TB- multidrug –resistant tuberculosis

HIV- human immunodeficiency virus

BCG- Bacillus Calmette –Guerin test

DOTS- Directly observed treatment short course strategy

DOT – Directly observed treatment

TM – tuberculosis mycobacterium

TM+ tuberculosis mycobacterium positive tuberculosis case

H-Isoniazid

R-Rifampicin

Z-Pirazinamid

E-Etambutol

S-Streptomycin

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Thinking of the time from 1994 to 1999 when I used to be a BRIMHEALTH student I remember it as a period of very stimulating communications, rewarding study work and sincere relationships.

Like any student within the project I was provided multiple opportunities to study public health experiences of Northern and Baltic countries, to acquire theoretical knowledge, to learn of culture and find co-operation partners.

Nya Varvet for me today is still a place I would love to visit again.

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## **Introduction**

### **Latvia after restoration of sovereignty in 1991**

The Republic of Latvia is located in the North-East of Europe in the Baltic Sea Economic Region and covers 64 589 km<sup>2</sup> of territory. The capital is Riga. The State borders with Estonia (north), Russia (east), Belarus (south-east) and Lithuania (south). The total population in the country in 2004 was 2,319 inhabitants which can be compared to 2,5 million in 1997.

The political and economic reforms carried out in the country and integration into the EU have had a positive impact on economic development. Economic growth rates in Latvia are among the highest in the EU. In the period between 2001 and 2003 the average GDP growth rate was 7.3% per year. The high growth rates were due to stable domestic demand and the good ability of Latvian enterprises to expand the export market.

Growth can be observed in all main sectors of the economy. The employment indicators have been gradually improving. The rate of job seekers aged 15-64 years decreased notably from 20.5% in 1996 to 10.7% in 2002 (1).

The reforms carried out in the previous decade have strengthened the private sector and created favourable macroeconomic conditions; the business environment has also improved. Investments continue to grow rapidly promoting the modernisation of production and transition to new and more productive technologies. Accession to the EU had a particularly positive impact on the development of the economy.

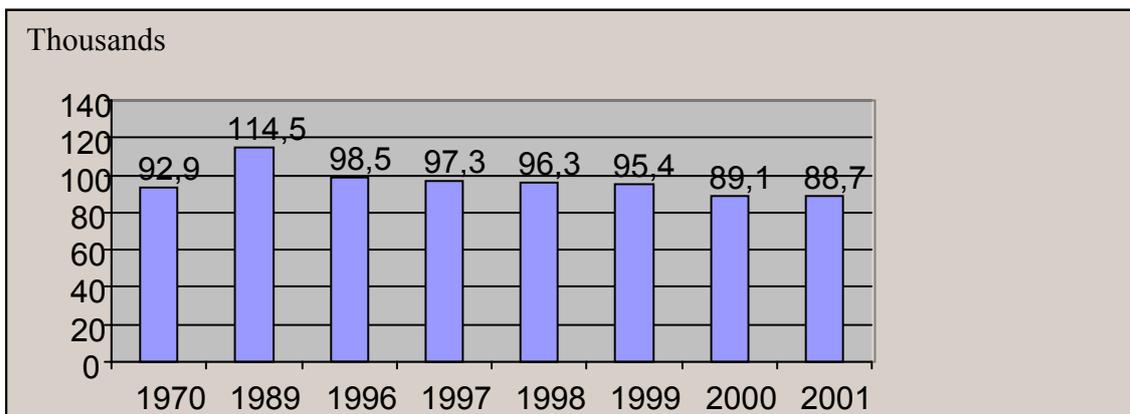
The 1990s was the time of deterioration of public health generally in Latvia. One could observe unsteadiness and low life expectancy in Latvia as compared to other European, Baltic and Northern countries. According to statistical data diseases of heart and blood-vessel system as well as cancer increased. The basic characteristics of the reform in the Latvian health care system included shifting the emphasis from curative medicine to disease prevention and health promotion, development of primary health care, and introduction of insurance system. Health care sector financing is still insufficient in Latvia. Most health care funding indicators in Latvia are among the lowest in Europe (2).

### **Liepaja**

Liepaja is situated in the western part of Latvia, on the coast of the Baltic Sea. Liepaja is the third biggest city in Latvia, a port city, first mentioned in historical documents in 1253. The total area of the city is 60,4 km<sup>2</sup> (incl. parks and gardens 18 %, waters 18%, industrial buildings 17 %).

The demographic trends in Liepaja have been similar to those in the whole country. The total population in 2002 was 86476; density was 1432 individuals per km<sup>2</sup>. The population size has decreased during the period of the restored Latvian state

independence. Figure 1. (3).



**Figure 1. The population of Liepaja 1970, 1989 and 1996-2001 in thousands.**

The number of inhabitants had further decreased to about 86 thousand in 2002. Then 58,5% were in the age of economic activity 18-60 years, 21,6% above the age of economic activity and 19,9% were under the age of economic activity (3). The largest population was reported in 1989 which was the time of rapid development of the biggest local industries.

There are two reasons for the population decline. A large numbers of former soviet citizens living in Liepaja began to repatriate to Russia; second, birth rate decreased due to social and economic difficulties. The ethnic structure has not changed significantly since 1991. Half of the inhabitants in Liepaja are Latvians and the biggest minority are Russians.

Liepaja is divided into three big living areas: Vecliepāja, Jaunliepāja and Karosta with 51%, 38%, and 11% of the total population respectively. The socio-economic profile of the population is strongly determined by housing condition. Availability and quality of housing in particular living areas is very much market-dependent: the most wealthy live in the most preferable living areas (beside the lake or the sea, or in the city centre), while others are socially and financially much poorer. The most affluent citizens of Liepaja tend to move away from the northern parts of the city.

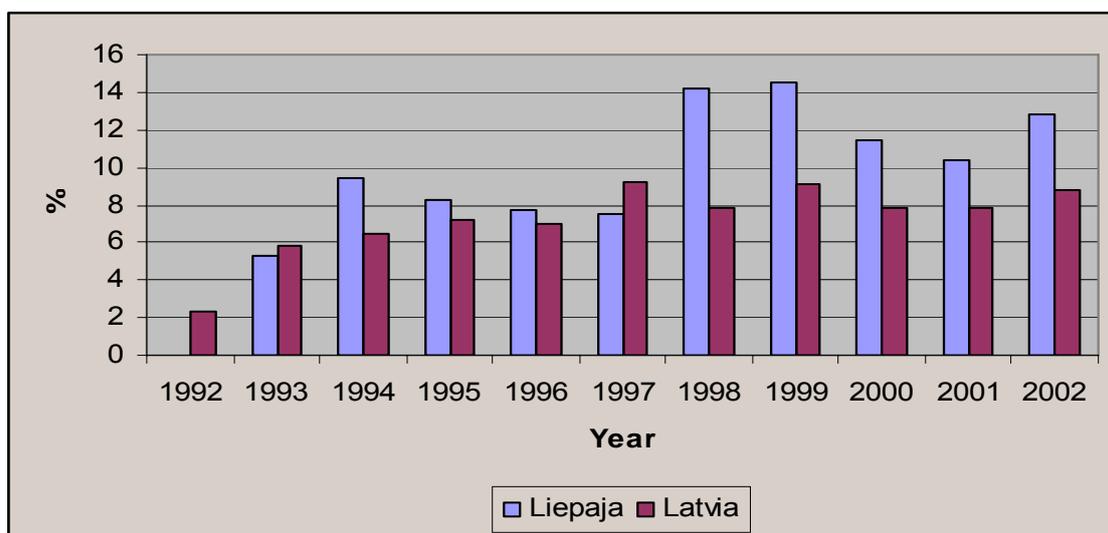
About 20 000 inhabitants lives downtown and in the surrounding areas which are part of Vecliepāja living area. The southern living areas of Liepaja, also parts of Vecliepāja, enjoy relatively good living conditions, as well.

Nevertheless, a big share of housing in Liepaja, particularly in the northern parts of the city (Jaunliepāja, Karosta) are in poor shape, and citizens with the lowest income, pensioners, unemployed and alcohol addicts live there (4).

Historically Jaunliepāja was an industrial area and a living area for factory workers. This was an area where poor habits and misbehaviour – alcohol, tramping etc. – were

traditionally common. Karosta is a living area in the northern part of Liepaja occupying about 1/5 of the total city territory. Karosta has always been a military area. Karosta began to enjoy the status of a civil zone in 1994 after withdrawal of the Russian army. Since 1994 the population in Karosta has decreased from 25 000 to 7000. There was plenty of empty space and unoccupied housing in Karosta. In line with the city policy families that had been evicted from the downtown housing were moved to Karosta. Other social groups like those released from penitentiary institutions were also provided housing in Karosta area. Thus Karosta developed into a community of the needy and unemployed (4). Beginning 2000 the City has taken complex measures to improve the social environment in Karosta: a school, a day-centre in the “Help house”, and an Employment office have been established. A sustainable housing development program has been initiated.

Unemployment, alcoholism, and drug addiction are likely to be strong contributing factors to increase occurrence particularly of infectious diseases during the 1990s. Figure 2 showed the development of unemployment in Liepaja and total Latvia.



**Figure 2. Unemployment proportions in Liepaja and Latvia in 1992-2002 in percentages.**

The unemployment proportion in Liepaja was higher than the average for Latvia during the whole period, particularly after 1998, when the biggest industries in Liepaja reduced jobs or closed due to the “Russian crisis”.

In total there are 17 general education establishments in Liepaja with about 12 300 students, 7 vocational middle level education establishments (3365 students) and 6 higher education institutions (6244 students) in Liepaja(3).

## Health care in Liepaja

Liepaja City Council has formulated the City Development Strategy for 2002-2010. The primary objectives of public health in Liepaja as well as the directions of activities necessary to reach the goals were defined as follows:

Primary objective: – to provide conditions for better public health care practice and better availability of health services, to strengthen measures for disease prevention. Directions of activities: – to create and implement a multisectoral strategy for ensuring sustainable health of the community; to develop available, effective and consequent health care system; to favour development of Liepaja, improving the City Hospital towards the level of a regional health care institution with high quality diagnosis, treatment and rehabilitation services available (5 ). Strengthening of PHC and multi-sectoral collaboration development play important roles.

Table 1 gives an overview of health care resources in Liepaja 1993 and 2002.

**Table 1. Health care resources in Liepaja**

	1993	2002
Hospitals	6	6
Primary health care centres	6	10
Physicians	301	273
physicians per 100 000 population	27,8	31,3
Nurses	736	634
nurses per 100 000 population	68,0	73,0

Both the absolute number of physicians as well as the number of nurses have decreased. The relative numbers have increased due to the decreased population size.

The specific resources for Tuberculosis services in Liepaja consists of: Inpatient hospital (50 beds), ambulatory department, laboratory, X-ray service Culture centre + microscopy centre. TB services in Liepaja employs 5 medical doctors, 14 secondary medical workers, 1 social worker, nurses' assistants, orderlies and technical staff. In 2002. the total number of medical staff involved in TB treatment in Liepaja was 51 (2).

The number of TB-treatment medical staff in Liepaja in 1993-2002 has not undergone large changes. A big concern for the country continues to be deficiency of medical doctors (phthisio-pneumologists). The two of them who are employed in Liepaja will soon reach the age of retirement.

During 2000-2004 a local government co-operation project was carried out between Liepaja and Bergen (Norway). The principal outcomes of the project were:  
-A model for the structure of public health in the City of Liepaja;  
-The activities of family doctors, medical nurses, nurses of school and pre-school

institutions were reinforced in terms of prevention of infectious diseases;  
-A Mother and child health care centre was established at the primary health care centre “Jaunliepaja” to improve availability of health care services for individuals who are not registered with family doctors (6).

## **Tuberculosis**

In 1993, WHO declared TB a Global Emergency in response to the dramatic increase of incidence rates of the disease in many parts of the world. According to the WHO, there were approximately 8.7 million new cases of TB registered per year. The multi drug resistant tuberculosis, MDR-TB, is defined by the WHO as patients infected with TB strains resistant to at least isoniazid and rifampicin, with or without resistance to any other drug. MDR-TB represents one of the greatest challenges to TB control. Estimates of the magnitude of the burden of drug resistance are difficult to obtain due to the lack of reliable epidemiological data. Recent research suggested that there is a considerable global variation, with several areas representing "hot spots" of high prevalence.

In the WHO European Region there has been an alarming rise in TB rates in recent years. From 1991 to 1996, the number of cases increased by almost 40%. The countries of Eastern Europe and the former USSR in particular have witnessed a marked increase, and nearly all of them exhibit incidence rates several times higher than the countries of Western Europe.

In Western Europe TB incidence rates have been declining steadily from the turn of the last century until the mid-1980s when a leveling-off occurred. In some countries small increases in the number of cases have been observed. In the countries of Eastern Europe and the former USSR the decline in TB rates following the Second World War reversed in the 1980s and 1990s. Dramatic social, economic and political changes were the suspected underlying factors behind this increase. In 2000, 369 935 new TB cases were reported in the WHO European Region compared to 231 608 in 1991. Most of these cases occurred in the countries of Eastern Europe and the former USSR (7).

Case notification rates have doubled in practically all previous Soviet countries since 1990, and in the Russian Federation the rates had tripled. In 2000, all previous Soviet countries except Armenia and Tajikistan reported more than 50 TB cases per 100 000 population. Kazakhstan, Kyrgyzstan and Romania reported 160, 126 and 122 TB cases per 100 000 population respectively. These figures are to be compared with the TB case notification rates in Eastern and some central European countries (Czech Republic, Slovakia and Slovenia) where most countries reported less than or about 20 TB cases per 100 000 population. The global rate of increase of TB was predicted to be 3% per year on average, but was much higher in Eastern Europe (8%) and in some African countries (10%).

In Eastern Europe the problem of drug resistance parallels the overall TB situation. MDR-TB is a man-made problem created by poorly functioning TB programmes.

Treatment of MDR-TB costs around 100 times more than treatment of drug susceptible TB, and the treatment success rate does not usually exceed 60%. In Western Europe the median prevalence of newly diagnosed MDR-TB cases was below 1%. In some countries of Eastern Europe and the former USSR irregular drug supplies, a lack of standardized treatment regimens, and factors associated with prisons were contributing to an increase of MDR-TB (7).

During the very last few years, TB incidence has decreased. The incidence of respiratory TB and TB with mycobacterium strains has also gone down. Seventy-one percent of the registered TB cases in 2002 were TB cases with mycobacterium strains (TM+) which causes danger for the rest of community members.

Since 1998 the mortality from TB and from after-effects of TB has been decreasing. Unfortunately in Latvia, we still experience high mortality from TB in the first year after detection. .

Tuberculosis is a serious threat to children's health.(8,9). The major activities aimed at effective TB control in children are BCG vaccination, preventive treatment of LTBI (Latent TB infection) and contact investigation. In addition tuberculin skin testing is used for screening. Finally early TB diagnosis and treatment in children is of great importance.

BCG vaccination is performed in Latvia for all newborns on the third and the fourth day after birth. Revaccination at 7 years and 14-15 years used to be applied but was revoked in 1993. Tuberculin skin testing used to be carried out yearly. This was replaced by screening every three years from 1993. From 2003, however, yearly tuberculin screening for risk group children was re-introduced for all children in living areas where paediatric incidence reaches 50 per 100000 and year.

### **Tuberculosis management in the period of health care reform**

The Health care reform in Latvia began with the restoration of the state sovereignty in 1990. During the following decade, a move from curative medicine to preventive medicine and health development was started and promoted. The system of family doctors was established. The role of family doctors in disease prevention was strengthened and the functions and scope of work of family doctors was increased.

Restructuring of hospitals began with a master plan, aiming at the effective management of resources. The result was provision of high quality secondary medical aid to the patients. Health promotion has been developed in the country as a whole as well as for particular community audiences. Private insurance companies are offering health insurance services.

The health care reform provided new opportunities for the improvement of TB control measures, particularly increased effectiveness. Proper management of technical and human resources has been very important within TB control programme in Latvia. It

was critically important that control of TB disease should be integrated into the primary health care system (10,11).

The technical and human resources that were necessary for implementation of the TB control programmes were not always sufficient. Experiences from several countries showed that involvement of local governments and developing multidisciplinary teams (consisting of e.g. social workers, educational professionals) were good resources for strengthening TB control. Non-governmental organizations could play a special role by contributing their competences and network resources. From a practical point of view it was known that relying on the existing NGOs was preferable to creating new ones. Community involvement was the “last but not least” for strengthening the effectiveness of TB control systems. Family members, volunteers and other groups of individuals should be trained in how to provide support for TB patients with the aim to enhance effectiveness of TB treatment process. Co-operation between local government and primary health care professionals was significant. Local government’s commitment, support and initiatives are very important for the implementation of TB control programmes (12).

TB prevention and treatment was part of the common health care system. During the last decade the health care system in Latvia had experienced a reform. Implementation of the reform was continuing. Improvement of health, life expectancy and quality of life were the expected outcomes of the reform. The effectiveness and quality of the health care system were challenged. The resources spent for a TB control programme has been claimed to have put TB under control (13).

As early as in 1988 the WHO proclaimed that TB control programmes should be integrated into a common health care system. Synergy between the objectives of the health care reform and TB control programme was to be established. Synergetic objectives, like effective strategy of spending for specific health purposes, including and equality, accessibility improvement and availability of health service for needy community members, is very substantial for TB cases.

### **Tuberculosis control: public health and human rights**

TB treatment and control on the one hand, human rights, public health on the other are closely. Interaction should be established between the three directions of knowledge and activity to produce expected results in the implementation of DOTS treatment strategy (cf below) and steady reduction of TB incidence.

The balance between human rights of an individual and health needs of the community must be established. Public health presumes gives priority to the purpose to ensure health for as big a part of the community as possible, but this sometimes results in restriction of the rights of an individual. Focusing on human rights, in turn, means that priority is given to the respect of dignity and rights of the individual. Table 2 illustrates the concepts

**Table2. Inter-connection between human rights and public health.**

	Public health control strong	Public health control weak
Quality of human rights high	Not possible to achieve	Human rights more important than public health control
Quality of human rights low	Public health control more important than human rights	Never acceptable

Strong human rights are normally considered more important than strong public health control in this thinking.

Behaviour of the individual patient and keeping to treatment regimen is highly important in case of infectious diseases (including TB) as far as public health is concerned. High prevalence of an infectious disease should be avoided and the risk of jeopardizing the rest of community should be reduced to minimum (14,15).

A case illustrates. In the beginning of January, 1998 four local newspapers in Liepaja published data on 23 individuals that had been infected with mycobacterium-TB. The chief doctor of Liepaja Tuberculosis Hospital revealed their first names, family names and home addresses to media. An intense debate began after the publications. The variety of views clearly reflected the controversy of the matter.

From a legal point of view the chief doctor had broken the Medical Treatment Law. The Law of Epidemiological Safety, article 13 states that data on individuals that are sick with infectious diseases should be revealed only to law enforcement institutions and to treatment-relevant persons. The debate became known nation-wide rapidly, and it initiated involvement of the entire medical society and government officials. No one could however, provide a convincing opinion.

The association of phthisio-pneumologists of Latvian society of medical doctors published an official view saying that doctors' ultimate goal is to protect human health and life and the matter is two-side: public concern and individual rights.

### **DOTS and the National tuberculosis control programme in Latvia and Liepaja**

DOTS means "Directly observed treatment, short course" and is in the narrow meaning a short course of chemotherapy. The model for the administration is basically that somebody is given the task to actually observe that the drugs are taken by the patient. In a wider meaning it is a strategy for tuberculosis control based on five primary elements:

- Political commitment of the government;
- Diagnostics in early TB detection is based on bacteriological investigation;

- Treatment by applying directly observed treatment short course – DOTS;
- Duly drug supply;
- Reporting and recording in accordance with international standards.

This kind of TB control strategy and TB treatment approach has proven effective in some situations.. Nevertheless, DOTS is insufficient in situations with high drug resistance level. (16,17,18).

WHO recommends to apply DOTS in countries with medium or high TB incidence. In 1995 DOTS had been implemented in about 70 countries; in 1999 it was accepted in 120 countries, including all the countries with high level of TB incidence; in 2001 DOTS was used in 150 countries In 1999 43% of all TB patients enjoyed the DOTS strategy; in 2001 the percentage had increased to 60%. A few years ago, the WHO and many other international organizations, like the World Bank, declared their commitment to the STOP TB programme. The principal goal was to increase DOTS application to the widest possible range of TB cases in the world and to reach treatment success rate of 85% by 2005 (18) .

The DOTS strategy in Latvia has been entirely implemented since 1997 and DOTS+ has been used since 1998.

DOTS was introduced in Latvia in 1995 following the guidelines developed by the WHO. The Government of Latvia had confirmed their commitment to the National TB Control Programme with respect to implementation of the DOTS strategy over the entire country, ensuring full accessibility irrespective of place of living, age, gender, employment status, income level or legal status (free or incarcerated) (18).

The major elements of the Latvian National Tuberculosis Control Programme (NTCP) are:

- NTCP – the central unit to be established;
- Handbook to be written and distributed;
- Standardized order of registration and reporting;
- Comprehensive educational programme;
- Network of laboratories for expectorate investigation;
- Treatment institutions integrated within the TB control programme with the aim of DOTS implementation and duly deliveries of medical remedies and diagnostic material;
- Monitoring plan;

The NTCP development plan was outlined in terms of activities within the NTCP in Latvia as follows:

- 1995 - the stage of active introduction of DOTS;
- 1996-1999 – the sustainable stage of DOTS;
- 1997 – introduction of DOTS+;
- 1997 – introduction of a drug susceptibility monitoring system (control of drug resistance)(18).

TB service in Liepaja were integrated in the implementation process of NTCP in 2000. Then the availability in Liepaja and Latvia as a whole for the following TB treatment services became theoretically the same:

- an intensive phase of treatment in an inpatients hospital for infectious cases, followed by DOT in ambulatory way in outpatients institution;
- after short hospitalisation and abaccilation followed by DOT in ambulatory way in outpatients institution;
- full ambulatory DOT treatment course;
- full treatment course in an inpatients hospital if necessary.

Treatment results are reported to the Latvian State TB Register and data are analysed for whole country and regions.

Since the time of DOTS implementation in 2000 the number of ambulatory cases in Liepaja after 2000 has been 18-20 per year. Nurses of TB service have provided DOT-at-home (5 times a week) for patients with movement disabilities, elderly and some other cases. The role of a nurse is critical in TB treatment process.

TB treatment should also be available at the family doctor's office within the PHC system. It should be pointed out, though, that family doctors in Liepaja were not very responsive to the TB control challenge and ready to provide ambulatory treatment for TB cases. In fact, there was not any effective collaboration between PHC doctors and TB specialists in Liepaja.

The Latvian Tuberculosis Control Association, in co-operation with Swedish Heart and Lung Health Association, opened the Patients' Education Room (PER) in Liepaja in 2000 within the project "Patient to Patient". At the time there were 7 rooms of this kind in total in Latvia including Liepaja (19).

Personnel who were involved in TB treatment carried out educational work with patients. In addition, a special nurse was employed in the ambulatory department of the TB hospital since 2000..Her duties was to provide training for patients, their family members, contact persons and any other concerned individuals. She worked on the issues of TB communication ways and cough hygiene, on disease features and on how to cope with side effects during the long period of treatment. Her job was also to work individually with patients who had difficulties to in daily routine therapy.

## **Aim and objectives of the study**

### **General aim**

The study aims to describe the epidemiology of tuberculosis in the city of Liepaja during the last 27 years and the management of patients with tuberculosis during the period 1993-2002. The study further aims to identify problems in TB management relevant to the increasing morbidity and the registered high levels of drug-resistance. There are no previous studies of management of TB in Liepaja.

### **Specific objectives**

More specifically the objectives of the study are:

to describe the general time trends in tuberculosis epidemiology in Liepaja for the period 1975-2002,

to describe the epidemiology of tuberculosis in the city during 1993-2002,

to identify socio-economic factors that may influence the risk to become infected with the disease, such as occupation, unemployment and living area,

to study delays of treatment, and compare the methods of diagnosis and the treatment regimens (drugs and duration, use of surgery) with international standards,

to give recommendations of what changes should be made and how to improve management of tuberculosis in order to decrease tuberculosis morbidity in Liepaja .

## **Material and methods**

The first part of the study describes the development over time of tuberculosis incidence and mortality for 1975-2002. The second part is a study of TB management in Liepaja using hospital records from 1993-2002.

Part one: The cases were all persons reported with tuberculosis in 1975-2002. The data sources were the yearly Health Statistics books at the Latvian Office of Medical Statistics describing the trends in tuberculosis epidemiology for the period 1975-2002. The definition and reporting of TB was changed between 1983 and 1984. In the Soviet time TB was classified as respiratory or extra-respiratory. Thus the cases of TB located in pleura and intra-thoracic lymph nodes were included in extra-respiratory TB. The classification of TB has then been changed in accordance with the WHO guidelines. The previous classification of respiratory/extra-respiratory was replaced with pulmonary/extra-pulmonary. Therefore TB localisation in pleura and intra-thoracic lymph nodes were included in extra-pulmonary TB (19).The description consists of the time series together with a description of cases according to person characteristics and living areas within Liepaja.

The second part: used data from the hospital records of all reported cases, 655, diagnosed during the period 1993-2002. The following variables were recorded: demographic characteristics of the patients such as age, sex and address; date of

diagnosis and duration of symptoms before the diagnosis, occupation, the performed investigations (X-ray, sputum and culture) and treatment regimens (drugs, duration, surgery); the outcome of treatment, cured, relapse, treatment failure, default. The source of infection (family contacts) was also recorded.

The study used data from the available individual patient records from Liepaja Tuberculosis Dispansery and TB Register of 1993 – 2002. Permission was obtained from the hospital to use the hospital records. They were chronologically systematized. Information was extracted selectively from the records and extraction sheets containing the variables of interest were developed. The incidence differences according to sex and age were described. The investigations also studied possible clustering of patients in high-risk living areas of the city and differences in occupation of the patients.

The differences of time from disease symptoms to diagnosis were described using the clinical data as well as investigation data (X-ray, sputum and culture) and treatment regimens (drugs, duration surgery). The proportions of cured patients, relapse, treatment failure and defaulted patients were estimated.

Data processing of the extraction forms for summary and analysis was done using EPI-INFO programme for statistical analysis (13).

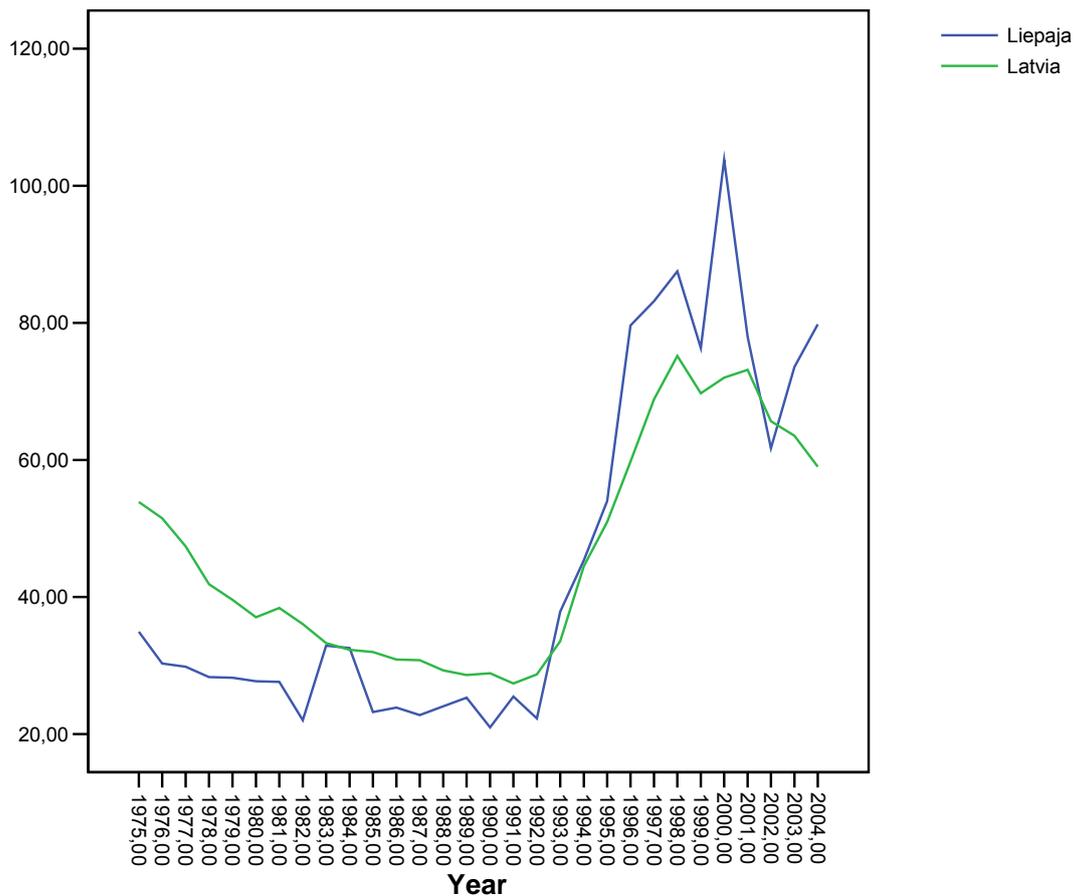
Ethical consideration: Permission was obtained from the Association of Medical Doctors and reference to the ethical codes and confidentiality were made.

## Results

### Epidemiology

#### TB incidence and mortality 1975-2002

Figure 3 shows the estimated TB incidence rates in Liepaja during 1975-2004 together with those for the whole country.

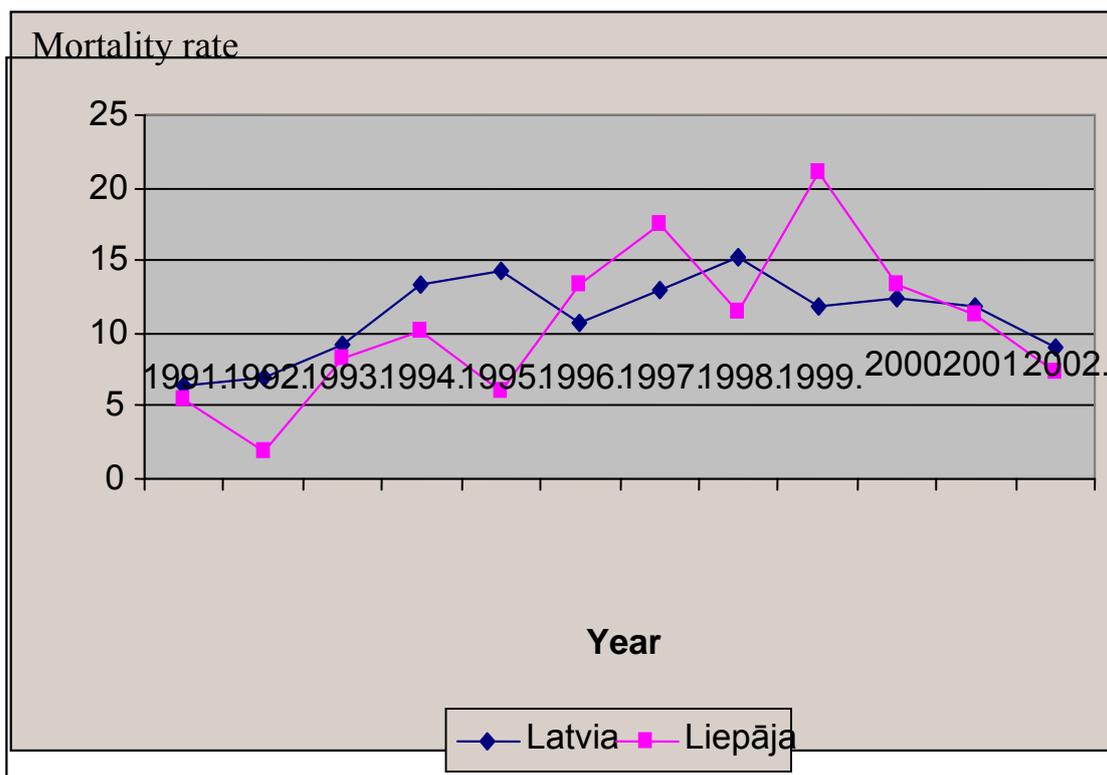


**Figure 3. Tuberculosis incidence rate in Liepaja and Latvia in 1975-2003 per 100 000 population.**

During the time period from 1975 to 1992 the tuberculosis incidence in Liepaja decreased slightly in Liepaja, except for the years 1982 and 1983(20). From 1991 there was a marked increase. From 1995, the incidence rate varied markedly at a much higher level than before reaching almost 100 per 100000 persons in the year 2000. Before 1991, the incidence rate in Liepaja was lower than in Latvia as a whole or very close to. After 1991, it was mainly higher. From 1991 to 1995, the TB incidence in Latvia increased about 2.4 times. In Liepaja the increase was about 2.8 times.

The standard errors of estimates for the incidence rate estimates were 4-5 per 100000 up to 1992 where after came a rapid increase to just under 10 during the years of higher incidence. The standard errors for Latvia as a whole are 1.5 – 2.0 per 100000, increasing slightly towards the end of the series. Comparing Liepaja and Latvia over two periods, before and after independence, Liepaja has incidence rates statistically significant below Latvia before and statistically significant above after.

During the 1970s, TB mortality was about 16 per 100000 persons and year both in Liepaja and Latvia as a whole. It decreased during the 1980s and for a period stayed at 5-6 per 100000 for Latvia as a whole. Liepaja exhibited even lower mortality. Figure 4 shows the development after 1991. As incidence increased from 1991, the mortality for Latvia increased and came to vary between 10 and 15 up to 2001. The mortality in Liepaja increased more rapidly and exceeded the national estimates particularly in the peaks of 1998 and 2000. For the latter year mortality in Liepaja reached 21 per 100000 in Liepaja. From 2001 we see decreasing mortality both in Latvia as a whole and Liepaja.



**Figure 4. Tuberculosis mortality in Latvia and Liepaja 1991-2002. Deaths per 100 000 population and year.**

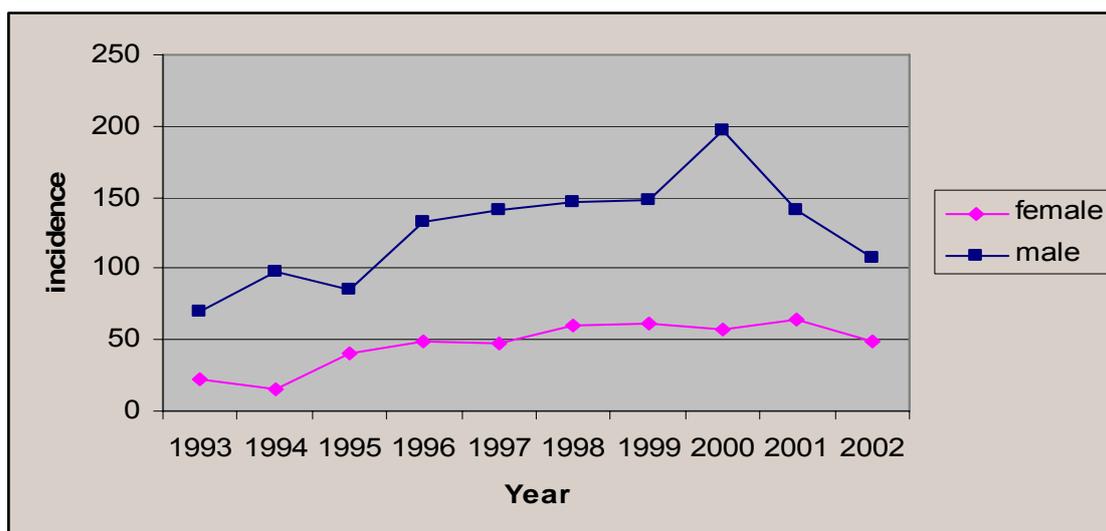
### Tuberculosis incidence by gender and age

The ratio of TB cases between men and women in the world is often quoted as 2:1 (21) but with large variation in time and between geographical areas. Table 3 shows the estimated incidence rates in Liepaja for men and women over the time period 1993 - 2002. Except for the youngest part of the population and persons above 65 years, the male incidence rates exceed those for female. In the age range 25-64 years, the ratio, male to female incidence is between 2 and 4. There is a clear peak for the incidence in male aged 35-54 years.

**Table 3. Average incidence rates per 100 000 persons and year for the period 1993-2002 in Liepaja by sex and age group.**

Age group	Incidence rate men	Incidence rate women
0-4	13,8	3,5
5-9	6,9	8,0
10-14	15,0	19,6
15-24	41,6	25,4
25-34	72,8	43,9
35-54	234,6	101,7
55-64	80,9	25,4
>65	56,6	24,2

Figure 5 shows the incidence rates for male and female over the time period 1993-2002. The increase in absolute numbers for men is larger than for female. The ratio 2:1 is too low for most years. For 2000 the ratio is rather 4:1.



**Figure 5 Yearly Incidence rates of tuberculosis by gender in Liepaja in 1993-2002 per 100 000 population.**

TB in children and adolescents is a sensitive epidemiological indicator. It shows the recent transmission of disease. Along with TB in children the incidence level was also growing in the two following age groups (15-24 and 25-34) in male.

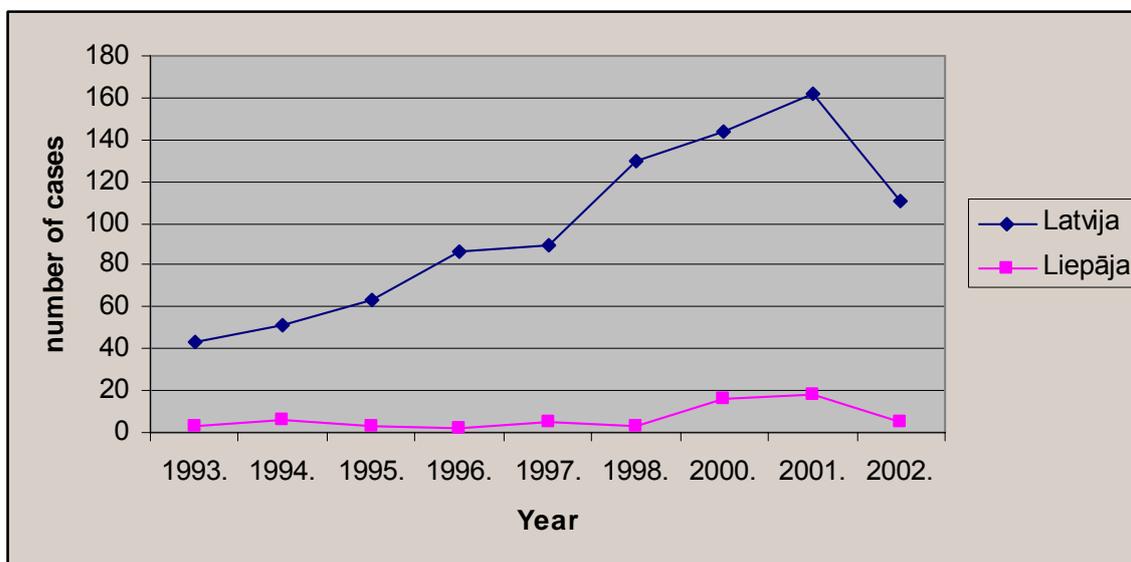
The highest incidence rate was observed for the age group 35-54 over the entire period. This age group is the most active one therefore the risk to get infected is the highest.

A declining trend of incidence was observed for the age group of 55-64. In the age group over 65 there was a slightly higher incidence among men.

There was a difference between genders in different age groups. In the age group below 24 the incidence rate for women was two times higher than for men. In the age group of 35-54 men's incidence was by 1,5 times higher.

### **Tuberculosis in children in Liepaja.**

In Liepaja in 1993-2002 totally 70 new cases among children were notified. Of these, 13 children were detected among 76 persons that had contact with known cases. In 1998-2002, 42 new TB cases in children were detected. Of these, 29 them were detected as the result of contact investigation and preventive examination. For example, in Latvia 34,7% of all new cases in children were detected during contact investigation at the same period.



**Figure 8. Number of registered tuberculosis cases in children in Latvia and Liepaja in 1993-2002 numbers of cases.**

Figure 8 shows the absolute numbers of new TB in children in Liepaja and Latvia (18). For the peak year the number of cases in Latvia is about 8 times as high as in Liepaja.

The population of Latvia is about 25 times that of Liepaja, indicating a larger incidence or detection rate.

**Table 5. TB incidence for male and female children per age groups in Liepaja in 1993-2002 in absolute numbers.**

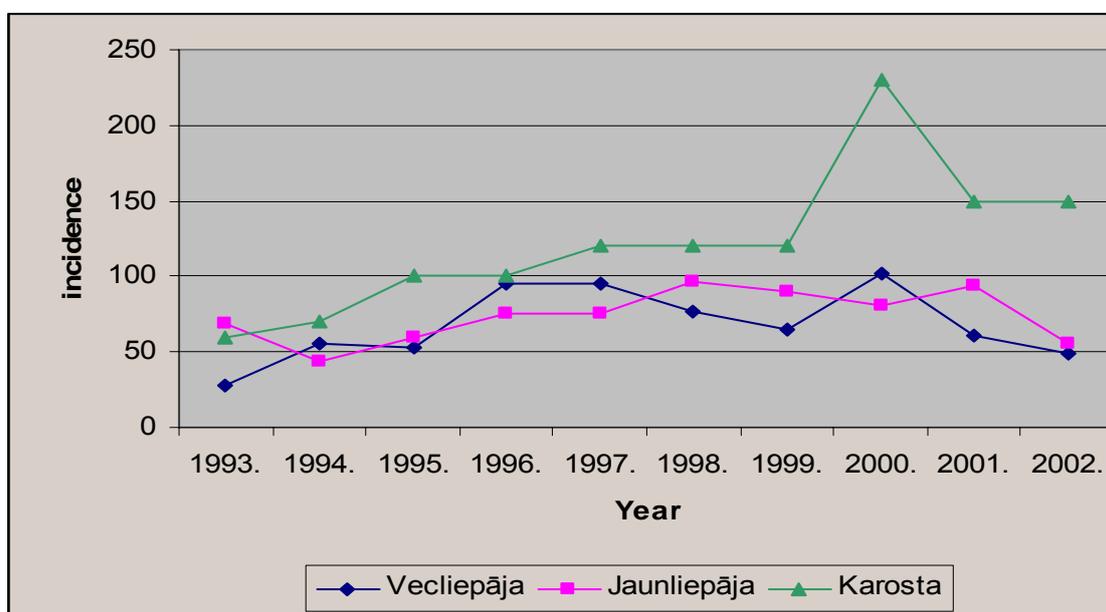
	0-4	5-9	10-14	15-17	Total
Male	12	6	13	10	41
Female	2	7	17	3	29

Table 5 shows that TB registered numbers in male children was higher than in female children. The lowest proportion of TB incidence in female children is among 0-4 year age group. The highest incidence level among female children was in 2001. There is evidence of some decline in 2002. TB incidence in male children reached the highest level also among the ten- fourteen years old ones (31,7%). The rate also was high for male children in 0-4 years (29,9%) and in adolescence (25%).

The majority of TB cases among children and adolescents were non-infectious. This was mainly due to TB form (often TB of intra-thoracic lymph nodules). There were registered MT+ cases in 16 and 17 years old adolescents, one of them diagnosed as a MDR-TB case in 2000 (infected by his mother), and cured in 18 months. There were no death cases from TB in the studied period in Liepaja.

#### **Tuberculosis in living areas in Liepaja.**

Figure 6 shows the incidence rates for the period 1993 to 2002 in the three living areas.



**Figure 6. Tuberculosis incidence rates by living areas in Liepaja per 100 000 population in 1993-2002.**

The TB incidence rates show quite similar development in Vecļiepaja and Jaunļiepaja with slight increases. The most unfavourable development in Liepaja was seen in Karosta area with markedly higher incidence rates particularly during the last years of the series. (22). Fatality rate in particular living areas in Liepaja in 1997-2002 averaged 10% with large unsystematic differences between years and areas.

### **Incidence of tuberculosis in social groups in Liepaja.**

Table 3 shows the distribution of new cases over different population groups. A high proportion of cases occur among unemployed. No definite trends over the years can be observed.

**Table 4. Percentages of new Tuberculosis cases in social groups in Liepaja in 1993-2002.**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Unempl.	37,5	62,2	48,0	58,6	42,2	42,5	44,0	42,2	50,5	52,3
Employed	35,0	6,6	28,8	10,6	24,6	21,4	13,1	20,1	7,0	24,6
Pensioners	12,5	8,8	7,6	17,3	19,4	21,8	15,4	13,4	9,4	10,7
Children	10,0	13,3	7,6	2,6	9,0	4,5	10,7	16,3	20,9	7,6
Disabled	5,0	4,4	1,9	8,0	0	6,8	15,4	6,7	8,1	4,6
Medical staff	0	4,4	5,7	2,6	3,8	2,3	1,1	1,0	3,4	0
Socially sensitive*	65,0	88,7	65,1	86,5	75,3	75,6	85,5	78,6	88,9	89,1

\* children, disabled, pensioners, unemployed

The proportion of unemployed among TB cases remained high during the period, some decline was observed in 1997-2000 (less than 50 %), but the proportion of unemployed increased again in 2001-2002 though it did not reach the peaks of 1994-1996.

In Latvia during 1997-2000 the proportion of unemployed among cases was lower (15-40%) than in Liepaja ( 18). Pensioners is a group in the population with low incomes. 1996-1998 pensioners constituted 17,3 % - 21,8 % among the newly detected cases. The proportions of socially unprotected (or sensitive) groups among new TB cases exceeded 50 % during the decade and reached the level of almost 90 % in 1994, 2001, 2002.

### **Tuberculosis incidence among medical staff in Liepaja.**

Medical staff is one of the highest risk groups in population due to TB (9,23). During the years 1993-2002, 16 cases were diagnosed in Liepaja. Half of these were nurses and 4 were physicians. The cases are largely distributed evenly over the years. During 1998-2002, that is 5 years totally 150 cases among medical staff occurred in Latvia. There is no trend over the years. The numbers of cases in Liepaja and Latvia related to the

general population sizes are similar.

## Case detection and treatment

### Tuberculosis case finding in Liepaja 1993-2002.

During the 1980s, broad application of mini X-ray screening was used. More than 70000 mini X-ray examinations were made yearly and the proportion of detected cases was about 0,01%. In 1993 the principles of early detection was changed. The majority of detected TB cases in 1993-2002 were diagnosed after the patients had experienced complaints that may be possible TB indicators (18). During the decade 18,3% of the TB cases were detected as the result of preventive examinations. The highest proportion of TB detection in preventive examinations in a year was 29.3% in 2002. (Table 5).

**Table 5. Tuberculosis cases detected in preventive examinations as per social groups in Liepajain1993-2002 in absolute numbers.**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Total	10	13	11	8	9	14	22	23	28	19
Unemploy ed	4	9	2	3	4	7	5	7	10	4
Pensioners and disabled	3	4	1	2	1	1	9	1	2	3
Employed	3	-	8	3	4	6	8	15	16	12

Among the 655 TB cases detected during 1993-2002 in Liepaja, 98, 20.3%, were individuals with long-time TB contacts. (Table 6).

**Table 6. Reported tuberculosis cases that had been in contact with tuberculosis patients among all detected cases in Liepaja in years 1993-2002 in absolute numbers and proportions.**

Year	2001	1993	1994	1995	1996	1997	1998	1999	2000	2002
Detected cases	69	40	46	52	75	77	80	69	93	54
Cases with TB contact	8	9	12	16	20	19	17	8	19	6
Proportion (%)	11,5	22,5	26	30,7	26,6	17,1	13,6	11,5	17,7	11,1

The proportions of notifications by family doctors was growing: from 19,5% in 1994 to between 25% and 37 % during the last 5 years of the decade.

Between 37 and 50% of the cases (37,3%-50%) visited TB-professionals. The proportion of cases notified by the Central City Hospital remained stable (17%-19%)

during the period, though it reached 30% in 2000-2001. These cases were mainly hospitalised in therapeutic departments with complaints on permanent cough. Diagnosis of TB by culture investigation was applied to all cases suspicious of TB infection. X-ray examination was used as a diagnosis criterion to patients having negative laboratory investigation results thus drawing diagnosis on this method.

In the last years of the studied decade, social services established City night shelter. Some times these were overcrowded and there were quite many people with permanent cough suggestive of TB. From 1999 to 2002, 22 cases were identified here as a result of active TB case detection in high risk groups of population. It is also the result of multidisciplinary team work. Both medical and social services were involved in TB detection at these places. It is one of possibilities in active TB case detection. Considering MT + cases in Liepaja in 1993-2002 data showed that the biggest number of detected cases by means of contact investigation was as follows: 3 in 2001, 2 in 1997, 1 in 2000.

### Diagnostic delay

Studies of diagnostic delay in the health care seeking, diagnosis and treatment process normally considers different kinds of delay. The most important are as defined by Long (24):

delay to 1<sup>st</sup> health care provider is the time from onset of symptoms to visit to any health care provider

providers delay is the time from the 1<sup>st</sup> visit to any health care provider to the time for TB diagnosis

patients's delay is the time from onset of symptoms to 1<sup>st</sup> hospital visit

doctor's delay (medical delay) is the time from 1<sup>st</sup> hospital visit to the time for TB diagnosis.

For this study, only provider delay can be considered. Figure 7 shows the development of provider delay in the period 1993 to 2002. There are decreases for all patients as well as for the sputum positive patients. The latter quite naturally have shorter provider delays. A detailed study of the delays is warranted.

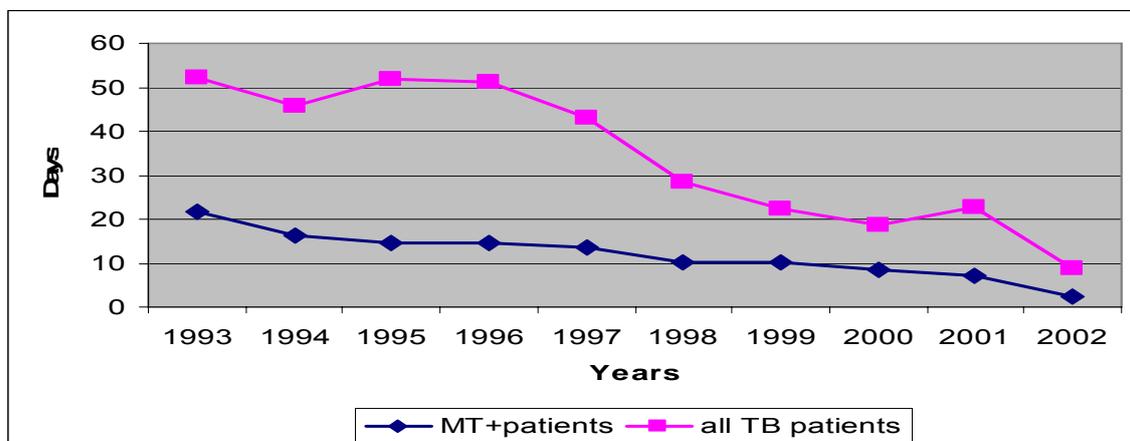


Figure 7. Duration of tuberculosis diagnosis processes (from the 1<sup>st</sup> visit to any

**health care provider to the day when diagnosis is made) in Liepaja 1993-2002 for all tuberculosis cases and mycobacterium positive tuberculosis cases in days.**

### **Multidrugresistant tuberculosis in Latvia and Liepaja.**

Multidrug resistance to anti tuberculosis drugs has been known since Streptomycin was discovered in 1945. Nevertheless, until the 1990s drug resistance wasn't a great problem in TB control in Latvia. Very high increases in drug resistance and multidrug resistance were registered in 1994 (25,26,27). In 1997, 12.9% of all newly registered cases in Liepaja were MDR-TB cases. The percentage decreased to 1% in 2000) The level was still high in 1998 and in 1999(7-8%). .In general in Latvia the MDR-TB absolute numbers remained at a rather high level from 1998 to 2002, 200 cases per year (18).

### **Applied tuberculosis treatment regimens in Latvia and in Liepaja.**

The aims of the TB treatment is to cure patients with at least interference with their lives, to prevent death in seriously ill patients, to avoid relapse of disease, to prevent the development of resistant tubercle bacilli and to protect family and the community from infection.

Different options to receive DOT were provided by TB services in Latvia and Liepaja:

- hospital based treatment during the intensive phase for infectious TB patients followed by ambulatory DOT;
- short hospitalization for confirmation diagnosis and DOT ambulatory treatment after smear conversation;
- full course of chemotherapy,
- full course of treatment in the hospital in special situations (26,28).

Beginning 1997 when DOTS was introduced in Latvia the number of combinations of different preparations had decreased, and the proportion of applied first therapy preparations increased to 75% (for comparison: 24% in 1993). Beginning with 1997 the first regimen of DOTS was more often applied in 76% ( H+R+Z+E or H+R+Z+SM), but HRZ was 1,2%. The second regimen (H+R+Z+E+SM) was used in 7,5% in 1993 and 5,1 % in 1997. Application of 4 preparations (the first regimen of therapy) within the chemotherapy short course (EHRZ) varies from 27,5% in 1993 to 81% in 1998 due to individual treatment regimens in Liepaja. Along with introduction of DOTS+ programme for MDR-TB treatment preparations of the second group were applied, like protionamyd, cikloseryn, kanamicyn, tibon, PASS, ofloksacyn, kapostat(39).

Thoracic surgery had an important place in TB treatment for many years in the country. Since DOT in TB treatment was introduced, the number of surgical interventions decreased, although the importance of these method had increased in MDR - TB treatment. One of the most common indicators for lung surgery was suspicion of malignant disease or a combination of TB and malignant disease.

### **Results of tuberculosis treatment outcome in Latvia and Liepaja.**

Data on TB treatment results are available since 1997 (18, 29). In total Latvia 2000,

70% of patients were reported as cured, 10% as failures, 13 percent as interrupted and 7% as death (18). Table 7 shows the percentages of treatment results in Liepaja 1993-2002.

**Table 7. Tuberculosis treatment outcome for mycobacterium positive tuberculosis cases in Liepaja in 1993-2002 in percentages.**

Treatment outcome	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Cured and completed	71	66	65	74	55	75	76	78	85	84
Treatment interruptions	25	12	13	13	21	7	4	17	12	8
Died	4	22	13	13	24	17	20	5	3	8

Proportion of treatment success was lower before introduction of DOTS in Liepaja. The lowest rate of cured cases was in 1995 (65%) and in 1997 (55%) Along with introduction of DOTS in Liepaja and Latvia number of cured cases increased reaching 85% in 2001. While before 1997 the average rate of cured cases were 66,2%, after 1998 it was 79,8%.

The highest proportion of death cases in 1997 was one quarter of the MT+TB cases. Proportion of death cases in 1993-1997 was 15,2% in average, while in 1998-2002 it was 10,6%. The death rate has decreased by 4,6%, though it was still higher then the common level in Latvia (29).

The highest rate of treatment interruptions was in 1997 - 21%. During the following years, there were an evidence of a decline (3 % in 2001) and again reached 8 % of treated new TM + TB cases.

Treatment failures had been registered in four of the analysed ten years. In 1993, 1994 the rate was high – 14 % Some decline was observed by 2001, 2002 – 9 % and 4 %. Common rate of treatment failures in Latvia was lower 1-2,5% ( 29 ).

During the five years period (1998-2002) the average number of relapses was 14,3 per 100 000 population. The highest level ( 16,9 ) was reached in 2001 There was no trend towards decline of number of relapses so far.

Very serious situation from epidemiological point of view according to relapses were number of registered multidrugresistant TB cases It was very risky source of TB infection in the community A new category of treatment outcome-MDR-TB was introduced .These patients were analysed in MDR - TB cohorts, according to the programme DOTS – plus; a treatment programme for MDR-TB patients (18 ).

**Table 8. Multidrugresistant tuberculosis cases among treatment relapses in Liepaja in 1998-2002 in absolute figures and percentage.**

Year	1998	1999	2000	2001	2002
Number of relapses	11	15	12	15	12
Number of MDR-TB	3	4	5	5	6
Proportion (%)	27	27	45	30	50

The MDR-TB cases after confirmation of the diagnosis were shifted to the MDR-TB register whereas in the cohort of relapses they were shown as MDR-TB. Proportion of MDR-TB among relapses showed evident increase: from about 30% in 1998 and 1999 to 50% in 2002.

## Discussion

More than 100 years have passed since R Koch discovered *Mycobacterium tuberculosis*. More than 200 million people all over the world have been suffering from long periods of tuberculosis since then. Currently, increasing TB incidence rates are reported from many parts of the world.

In Latvia, TB was under control with slightly decreasing incidence during the 1980s. The incidence was at the average European level. The diagnosis of TB was mainly based on x-ray screening rather than bacteriological confirmation. After Latvia regained independence in 1991, there was economical and political disruption resulting in change of the health care system. TB incidence in the country increased rapidly. Liepaja had incidence rates lower than Latvia as a whole before 1992 but incidences became as high as or higher than the whole country after that. Incidences increased 2-3 times. Mortality increased as a reflection of the incidence increase.

The study shows that the situation of TB in Liepaja continues to be complicated. Political, social and economic changes after 1990 in the East European countries, including Latvia influenced strongly the health care system (1, 3,20,29,30). Transfer from centralised administrative economy to market economy resulted in decrease of income level and growth of unemployment level in Latvia as well as in Liepaja. Tendencies were stronger in Liepaja than in the whole country. These circumstances provoked increase of alcoholism, tramping and drug abuse. The unemployment in Liepaja in 1998-2000 exceeded the average level in Latvia by 3 percent units ( 1, 3 ). The study identified problems in TB management, increasing incidence, and mortality and registered high levels of drug-resistance and high proportions of treatment failure. Infectious disease control effectiveness depends on the socio-economic situation (3). In a situation with economic collapse and changes in the health care system, it became difficult to cope with the rapidly increasing TB incidence and prevalence in the beginning of the 1990-ties. The worst epidemiological situation was reached in 1994

with TB incidence 98,8 per 100 000 population (20) especially in economically active age groups (11).

The differences in TB incidence rate between genders were similar to what is known in the Eastern European countries. The TB incidence among men was twice the rate among women. Traditionally women used to be more cautious about their health, assuming more responsibility for their family. Male adults were out of home more often than female adults and exposed to higher risk of being infected. Men are generally more exposed to diseases associated with their living style (21).

TB mortality has increased since 1993 slightly more in Liepaja than the average of Latvia suggesting prolonged transmission of TB in the community. The TB death rate was as high as 5,36 per 100 000 inhabitants (29) High fatality from TB in the first year after TB diagnosis indicates late diagnosis and treatment. Fatality rate in the first year after TB detection was higher in Karosta and Vecliepaja, the socially vulnerable areas, compared to Liepaja as a whole.

TB is partly a social disease. The correlation between poverty and TB is well known. Also in the most developed countries in the world, the highest rate of TB incidence is observed in the poorest territories (30). The study confirmed that the most unprotected social groups (children, pensioners, unemployed) were most of all exposed to infection. The most unfavourable situation in Liepaja was observed in Karosta that have large prevalences of socially sensitive groups (children, unemployed, disabled people, pensioners) compared to Vecliepaja and Jaunliepaja (3,4). The social service in Liepaja has played the primary role in early TB detection among the population of Karosta. There were no family doctor's practices in the area. Knowledge of TB incidences in social groups and age groups in different city areas in Liepaja are important to for planning of education and awareness raising.

Medical staff is at high risk of getting TB. This problem has been observed in other countries e.g. Estonia (23). The risk to become infected with TB depends both on individual's predisposition to infection and of exposure time with infectious TB case (or duration of contact). In average 30% of individuals who spend much time together with TB patients become infected with TB. Most of TB patient who received effective TB therapy became non-infectious in two or three weeks. Nevertheless, several risk factors increased the probability of becoming infected with TB, like chronic diseases or poor immune status. The risk of nosocomial transmission will be high as long as cases with active TB are treated within the health care system.

Strong preventive measures could decrease risk of transmission of TB in the health care facilities evidently. Administrative and engineering concern must be taken. Protection of the personal respiratory system should be introduced to full extent in order to decrease TB risk in medical treatment institutions. Before 1998 the epidemiological activities against TB infection in the previous Soviet territory were mostly based on application of disinfectants. Less attention was paid to environment protection and protection of the respiratory organs of personnel.

TB incidence among children and adolescents is a sensitive indicator of recent transmission of the infection. (8,28). The number of detected paediatric cases was increasing in the study period. Five six children in average were notified yearly during 1993-1997 whereas in 1998-2002 the number had increased to nine-ten new paediatric cases yearly (18, 29). Children get infected with TB mycobacterium after close and permanent contact with infected adults. Thus examination of detectable contacts for TB-infected persons play a critical role in prevention of TB incidence in children. High proportion of paediatric TB cases might indicate many undetected sources of TB infection and predict incidence increase in future (31).

Early detection through contact tracing depends on medical delay which might be reduced by means of sending the patient to a hospital or to a specialised medical institution as soon as possible. The communication between medical staff of PHC and TB specialists can be improved reducing the risk of medical delay (32,33). Delayed diagnosis and delayed treatment occur due to poor community awareness about TB, negligence of people to their health, poor access to the health care services and poor family economy (). In Liepaja a declining trend of medical delay was observed, The general trend was positive, particularly for MT+ TB cases.

The total time interval from the first visit to health provider to diagnosis in a Tanzanian study was 22,8 days in average, for 33,8 % of cases diagnosis provided in 10 days. For 66,2 % treatment was started more than 10 days after. Only for 2,7%, treatment was started in the first three days. In the Tanzanian study delays of diagnosis provided by doctors were much shorter than described in a Japanese study where the average medical delay was one month. The difference might be due to the high incidence rate in Tanzania making medical staff more suspicious about TB as a probable diagnosis while in Japan the lower incidence rate makes Japanese doctors less cautious of TB diagnosis. In general, it is necessary to increase both patients' and doctors' vigilance with respect to TB ( 33, 34 ). Another study on delay was carried out in Vietnam. In this study, the defined medical delay was four weeks from the first visit to providing diagnosis. It was concluded that there were no correlation between this period of detection and either age, or gender, or education, or income level. (24) The results in Liepaja showed that medical delay could be decreased.

Direct access to specialist played an important role in early detection of TB. Still, early detection of TB is the family doctors responsibility (33). The number of cases detected and notified by family doctors increased in Liepaja during the study period but the family doctors are a TB control resource that had not been fully involved yet. The number of detected cases is also dependent on how carefully family doctors examined their patients (31).

At least 1/3 of patients came to a TB specialist themselves while another 1/3 of the patients were transferred from other inpatients hospitals in Liepaja. Among the new cases detected 2003 in Riga, 26% had been sent by family doctors, 24% had come themselves at the TB ambulatory department with complaints, 40,5% had first been hospitalised in general inpatients hospitals. The research results indicated delayed admission to doctor and point again to the critical role of a family doctor(31).

Multi Drug Resistance Tuberculosis is a global challenge. The best described registered TB outbreak occurred in the 80-ties of the last century in New York. In a study by WHO, covering 108 countries it was discovered that drug resistance occurred everywhere and it is very much associated with the quality of TB control programmes and the level of social and economic development of a country. There were several reasons why drug-resistant TB and MDR-TB as the most severe form developed. Most often there was a combination of reasons, like low quality medical remedies that failed to contain the proper dose of medicine; medical staff without proper understanding of basic principles of curing and failure to ordinate proper treatment regimen. Patients were not properly involved in treatment resulting in deliberate breaks of treatment regimens or chaotic use of medicine (35).

In 1996 a global study revealed that the MDR-TB rate in Latvia was high and reached the level of 14% among newly detected cases. For patients who had previously been treated with anti-tuberculosis medicine the MDR-TB prevalence reached 54%. Doctors' council was acting from 1997. A commission of specialists should support the responsible doctor in the decision on the treatment regimen and duration for each separate patient (27). The patients were registered in cohorts, and treatment results were evaluated every 36 months. Due to this persistent effort, MDR-TB incidence in Latvia has decreased by 51% for new cases and by 65 % for relapses. Nevertheless, the source of resistance still exists in the population. There is no quick rapid solution ( 25). In terms of treatment, MDR-TB is a more severe TB form than drug- resistant TB. Therefore it was more difficult to achieve good results in treatment. High quality laboratory facilities (testing drug susceptibility and providing diagnosis of MDR - TB and drug-resistant TB), teams of medical staff and public health professionals (developing cross-sector collaboration) are necessary to tackle the problem. In fact, the most critical point in MDR-TB prevention is correct treatment of drug-susceptible TB aimed to avoid development of TB resistance. MDR-TB is not a challenge any more in modern Western countries where the rate of occurrence is less than 1%. The same holds in the countries of Central Europe (Poland, Slovakia and Slovenia). In Estonia 14,5 % of cases were MDR-TB ( 25,27,35 ). In Liepaja (1995-2002) 4,8% of new cases were MDR-TB( 18,27,28), lower than the 7.1% registered for Latvia MDR.

The number of MDR-TB cases might easily increase if improper treatment regimens are applied. There is an “invisible part of an iceberg” that keeps the epidemiological situation in Liepaja unstable. Any quality deficiency in TB treatment might rapidly provoke deterioration of the TB situation. Within the total structure of drug resistance there is an increasing trend towards poly-resistance and MDR-TB.

Introduction of the DOTS programme in Liepaja has resulted in increase of the proportion cured cases. Proportion of treatment success was low before introduction of DOTS in Liepaja. The rate of treatment success with DOTS approached the average level in Latvia (79,8%) ( 18 ,29 ). The rate of TB relapses is a significant indicator of the epidemiological situation. In Liepaja in 1998 - 2002 the relapses rate was 14,3 per 100 000 inhabitants in average, and no declining trend could be observed..

Proportion of treatment interruptions in 1993-1997 was 12,8%, while in 1998-2002 it had decreased to 6,8% (18). The major reasons for treatment interruptions are poor availability of health care services, the patients' lack of information or lack of understanding on duration of treatment, patients tendency to stop taking medicine when they begin to feel better ( 28,36,37 ). The average rate of default among MDR-TB relapses was as high as 13%. This kept the epidemiological situation in Liepaja unstable. Treatment interruptions were fluctuating and the proportion of interrupted treatments was growing even by 8% to exceed the level in Latvia in 2002.

Treatment effectiveness depends on accurate use of standard short course chemotherapy. In the implementation of DOTS in Latvia and Liepaja several problems that had been inhibiting the process have been identified. There can be long a distance between the patient's home place and health care institution. Health care services and social workers might try to avoid dealing with the TB problem including the administration of DOTS. There can be a lack of motivation to work with TB patients as this does not result in additional payment. Patients were sometimes more concerned about getting the pension and prefer it to rapid treatment success. Finally there was a financial deficiency within the whole process.

Team building plays an important role in the process: primary health care professionals, social service and NGOs. The methods used for information about TB symptoms for different target groups have to be relevant and understandable. It was seen that more than half of the patients experience different unsolved problems of social character. thus it was critical to have social workers involved in the process (37,38,39,40).

Availability of information on TB prevalence, TB symptoms and actions in suspicious cases played a substantial role in duly diagnosis when applying the method of passive detection. It is important to address the right audience in due time. Large resources were invested for information and training for TB prevention (28,38,39,40 ). It is very important to educate all groups of professionals Development of the International MDR-TB Treatment Training Centre in Riga [Latvia} was started in 1999. The training centre started operation in 2001 and in 2004 it was acknowledged a cooperation partner of the WHO ( 41 ).

In the study all the known TB cases were investigated, no selection was applied. Nevertheless, not all TB-infected individuals had visited a doctor thus there might be unknown cases. The indicator of incidence rate per year also depend on how carefully family doctors examined their patients. Data validity problem might be connected with defining higher and lower risk groups. E.g. the socially sensitive groups in the study were identified drawing on information by the patients, not on document basis. Similarly - with the profession groups.

The TB definitions used by the WHO have been applied to this study, too, as well as criteria necessary for diagnosis and criteria of treatment success. Therefore, it might be expected that measurement bias was low in the study. Misclassification, though, might have some impact on validity. Entries in the case files had been made by different doctors which might have impact on validity. In addition, the tests including

expectoration examination had different level of sensitivity that might also affect validity. Validity would have been higher if data came from the same laboratory, but in the study different laboratories were involved. Also x-ray examinations were performed with different organisation and equipment.

Ambulatory patient cards were kept in strict chronological order. The number of ambulatory cards corresponded to the numbers of the registered cases in the State register for groups defined by years, by gender, age and other details. The criteria for TB diagnosis were at the same time patient's complaints on long cough and clinical investigation. The classification of TB has been changed during recent years in accordance with the WHO guidelines. The previous classification of respiratory/extra-respiratory was replaced with pulmonary/extra-pulmonary.

Beginning from 1977 various equipment has been acquired for TB treatment facilities: laboratory, x-ray service, ambulatory department etc. Bacteriological investigation plays an important role in TB diagnosis and treatment. Duly detection of infectious-TB cases and drug susceptibility tests of mycobacterium strain culture contribute significantly to TB control and treatment. However, the basic principles of methods used in bacteriological laboratory have not fully improved through to application of modern technology. The principal objectives are high validity and reliability of acquired results, safe work environment and speed of result obtaining. The culture centre and a microscopy centre within the laboratory network of the TB hospital in Liepaja is supposed to ensure proper fulfilment of the objectives.

Since the epidemiological situation in the eastern part of the Baltic Sea and the Barents Sea region grew worse in terms of infectious disease incidence, a Task Force for communicable diseases control in the region was established in April 2000. One of the basic objectives of the Task Force is to strengthen the role of local governments in the control of infectious diseases, including TB.

## **Conclusions**

The general conclusion is that the situation with regard to tuberculosis development and tuberculosis management in Liepaja during the period under study was unfavourable.

More specifically:

- \* the incidence and mortality, particularly through deaths in the first year after TB detection, were high compared to the whole country and increasing.
- \* the incidence was particularly high in specific groups, persons in economically active period of life, particularly men, persons in socially unprotected groups and medical staff.
- \* there was a high proportion of children among the total cases, which can indicate recent transmission of infection.
- \* there was much variation in the results of treatment : the frequencies of treatment failures, defaults, treatment interruptions were high compared to the whole country
- \* there was a high proportion of MDR-TB as the results of non-compliance of treatment due to insufficient understanding of the treatment process in patients.
- \* the links between local government, family doctors and medical professionals in TB

control activities were weak and there was no effective multi-sectoral collaboration.  
\* the objectives set up by WHO for DOTS treatment were not reached .

## **Recommendations**

### **General recommendations**

- Strengthen the role of local government and NGOs in the process of TB control through developing collaboration with primary health workers and other relevant institutions
- Distribute TB information and data on overall picture of TB incidence in Liepaja to family doctors more actively
- Promote the involvement of family doctors in passive detection of TB and integrate TB care into primary health services especially for ambulatory treatment
- Develop co-operation and information exchange between TB professionals and other specialists
- Create awareness in the community on TB-relevant issues, using information developed for special target groups.

### **Recommendations for improved tuberculosis control and management indicators in Liepaja.**

#### **\*Process indicators:**

Availability of health care services,  
Qualifications of professionals within health care system,  
Provision of the diagnosis process, What is this?  
Assessment of correspondence between laboratory data and data in the register.

#### **\*Result indicators:**

Number of treatment successes,  
Reasons for treatment interruptions,  
.Reasons for relapses,  
Reasons for treatment failures .

#### **\*Impact indicators:**

Trends of incidence, mortality and infection transmission,  
In-depth research on infection transmission drawing on data on paediatric incidence, to carry out inquiries, to produce forecasts,  
Incidence decrease according to experiences (might be 7-10% yearly) in the result of effective activities.

## **References**

1. Ministry of Economy of Latvia. Economics Review, 2004; Riga ;Ministry 2004.
2. Ministry of Health of Latvia. Health statistics and medical technology agency. Health statistic department: Year Book of Health statistics in Latvia 2003. Riga; Ministry ,2004.
3. [http// www.liepaja.lv/](http://www.liepaja.lv/). Facts sheets about Liepaja. . Updated 2004.

4. Liepaja City Council. Housing strategy in Liepaja .Liepaja; City Council 2004.
- 5.Liepaja City Council. Liepaja City Development Strategy 2002-2010.Liepaja;City Council 2002.
6. StatgaleI ,Reigstad AB, Kilkuts G. Municipal primary health care team-crossectorial model of participation. In: 6<sup>th</sup> Nordic-Baltic Congress on Infectious Diseases. Current strategies and treatment of Infections Diseases. Palanga, Lithuania 2004; June 3-6 .Abstract book p.130.
7. Arnadottir T .Multi-drug resistant tuberculosis: What is it? Why here? What can be done? In: the 5thBaltic Sea States Summit. Task Force on Communicable Disease control in the Baltic Sea Region. Laulasmaa Finland 2004 June 21.Final report pp12-15.
8. Elwood RK,Cook VJ, .Hernandez – GardunoE. Risk of tuberculosis in children from.smear negative source cases. INT J Tuberc Lung DIS 2005; 9 (1) :49 – 55.
9. Zalezsky R, Leimanis J, Pavlovska I.. The epidemiology of tuberculosis in Latvia. Monaldi Chest DIS 1997; 52: 142-146 .
10. FriedenT. How can tuberculosis control services be promoted and sustained? In:FriedenT. Toman´s tuberculosis. Case detection, treatment and monitoring. Questions and answers. 2nd ed. Geneva :World Health Organization. 2004: pp.330-332.
11. Kumaresan JA, de Colombani P, Karim E. Tuberculosis and health sector reform in Bangladesh. INT J Tuberc Lung DIS. 2000; 4 ( 7): 615-621.
12. Hadley M., Maher D. Community involvement in tuberculosis control: lessons from other health care programmes. INT J Tuberc Lung DIS 2000; 4 (5 ): 401- 408.
13. Weil DEC. Advancing tuberculosis control within reforming Health systems INT J Tuberc Lung DIS. 2000; 4 (7 ):597- 605. =
14. Hurting AK, Porter JDH, Ogden JA. Tuberculosis control and directly observed therapy from the public human rights perspective INT J Tuberc Lung DIS. 1999; 3(7 ): 553-560.
- 15.Luelma F. Why does treatment fail and what can be done to avoid treatment outcome In:. FriedenT. Toman´s tuberculosis. Case detection, treatment, and monitoring. Questions and answers. 2nd ed. Geneva: World Health Organization. 2004: pp.180-185.
16. World Health Organization. Treatment of tuberculosis: Guidelines for national programmes. Geneva; 1997:pp. 25 - 31.
17. World Health Organization. Treatment of tuberculosis: Guidelines for national

programmes. Geneva.; 1997:p.23.

18. Latvian State Center of Tuberculosis and Lung Diseases. Tuberculosis in Latvia 1991 – 2000; Riga; State center 2004:pp. 3-20.

19. Lepse I. Project Patient to patient- advantages. In: International Conference on Multidrug resistant Tuberculosis in the Baltic states. Riga, Latvia.2004;November23: Abstract book p.10.

20. Ministry of Health of Latvian republic. Health statistics department: Health year statistics 1981. Riga;Ministry 1982.

21. Holwes CB, Hausler M, Nunn P. A review of sex differences in the epidemiology of tuberculosis. INT Tuberc Lung DIS 2000; 2(2 ): 96- 104.

22. Liepaja Pedagogical Academy. Faculty of Sociology. Development issues for Karosta. Liepaja; Pedagogical Academy 2001.

23. Krümmer A, Danilovitsh M, Pelime L, Laisar T, Hoffaer SE, Katila ML. Tuberculosis as an occupational Hazard for Health workers in Estonia. INT J Tuberc Lung DIS 2001; 5( 2): 170- 176.

24. Long NH, Johansson E, Lonroth K, Eriksson B, Winqvist A, Diwan K. Longer delays among women in Vietnam. Int J Tuberc Dis 1999; 3(5): 388-393.

25. Leimane V. Multiresistant tuberculosis in Latvia. Latvian physician 2004 ;(11): 7-9.  
26. Leimanis J. Tuberculosis yesterday, today, tomorrow! Latvian Physician 2004; (11): 36-38.

27. Dravniece G. Multiresistant tuberculosis in Latvia.. For you, colleagues. 2004; (3): 85- 87.

28. Crofton J, Horm N, Miller F. Clinical Tuberculosis. London and Basingstoke: Macmillan. Education.LTD. 1992.

29. Latvian State Center of Tuberculosis and Lung Diseases. State TB Register 2002.Riga; State center 2004.

30. Spence WOS, Hotskiss J, Williams CSD. The changing face of tuberculosis: a new challenge to the developing world. Tuberculosis and poverty. BMJ 1993 307: 759-761.

31. Lonroth K. Public Health in Private Hands. Goteborg.: Department of Sociale Medicine, Goteborg University, and Nordic School of Public Health 2000 .

32. Wandwalo ER, Morkve O. Delay in tuberculosis case finding and treatment in Mwanza, Tanzania. Int. J. Tuberc Lung DIS 2000; 4( 2):133-138.

33. Veen J, Metzger P, Joncevska M, Duzey O, Zagorski A, Marsden A. Europe and

Asia Regional tuberculosis evaluation. Regional Report: submitted by LTG Association Inc. and TvT Global Health and Development strategies 2003 (10):5 - 8.

34. Lonnroth K, Thoun LM, Linh PD, Divan WK. Delay and discontinuity- a survey of TB patients search of diagnosis in a diversified care systems. *Int J Tuberc Lung DIS* 1999; 3(11 ): 992- 1000 .

35. Drobniewski FA, Balabanovska GM. The diagnosis and management of multi-drug resistant tuberculosis at the beginning of the new millennium. *Int. J. Infect DIS* 2002;(3): 6 suppl 1: S 21-31.

36. Bock N. What is the significance of default ( treatment interrupts ) in the treatment of tuberculosis ?In: FriedenT. Toman's tuberculosis. Case detection, treatment, and monitoring. Questions and answers. 2nd ed. Geneva: World Health organization. 2004: pp.263 - 265.

37. SanthaT. How important is follow up and what is the frequency of relapse after the completion of treatment? In: FriedenT. Toman's tuberculosis. Case detection, treatment, and monitoring. Questions and answers. 2nd ed. Geneva: World Health organization. 2004: pp. 267 - 268.

38. Honneland G ,Rowe L. Health as International Politics.Hampshire ;Ashgate Publishing Limited 2004:pp1-18.

39. Toman K. What are the keys to cure? In: FriedenT. Toman's tuberculosis. Case detection, treatment, and monitoring. Questions and answers. 2nd ed. Geneva: World Health organization . 2004: pp. 260-262.

40. Enavson DA. World tuberculosis control: Now have far have we go? *INT J Tuberc Lung DIS* 2000; 4( 12) :5219-5233.

41. Leimane V. History and development of WHO CC Latvia. WHO collaborating Centre for Research and Training In management of MDR TB. Riga, WHO CC Latvia; 2004: pp 4 - 5.

