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Summary Vision Screening Data: Latvia

Produced as part of Work Package 3

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1 Glossary of Terms: Vision Screening

Abnormal test result	A test result where a normal "pass" response could not be detected under good conditions. The result on screening equipment may indicate "no response," "fail," or "refer."
Attendance rate	The proportion of all those invited for screening that are tested and receive a result: • Invited for screening includes all those that are offered the screening test. • Tested and receive a result could be a "pass" or "referral to diagnostic assessment". Attendance rate provides information on the willingness of families to participate in screening.
Compliance with referral (percentage)	The percentage of those who are referred from screening to a diagnostic assessment that actually attend the diagnostic assessment. Percentage of compliance provides information on the willingness of families to attend the diagnostic assessment after referral from screening.
Coverage	The proportion of those eligible for screening that are tested and receive a result: • Eligible for screening includes those within the population that are covered under the screening or health care programme. • Tested and receive a result could be a "pass" or "refer to diagnostic assessment". Factors such as being offered screening, willingness to participate, missed screening, ability to complete the screen, and ability to document the screening results will influence the coverage.
False negatives	The percentage of children with a visual deficit (defined by the target condition) that receive a result of "pass" during screening. Example: If 100 children with visual deficit are screened, and 1 child passes the screening, the percentage of false negatives is 1%.

False positives	The percentage of children with normal vision that are referred from screening to a diagnostic assessment.
Guidelines	Recommendations or instructions provided by an authoritative body on the practice of screening in the country or region.
Vision screening professional	A person qualified to perform vision screening, according to the practice in the country or region.
Inconclusive test result	A test result where a normal "pass" response could not be detected due to poor test conditions or poor cooperation of the child.
Invited for screening	Infants/children and their families who are offered screening.
Outcome of vision screening	An indication of the effectiveness or performance of screening, such as a measurement of coverage rate, referral rate, number of children detected, etc.
Untreated amblyopia	Those children who have not received treatment for amblyopia due to missed screening or missed follow-up appointment.
Persistent amblyopia	Amblyopia that is missed by screening, or present after the child has received treatment.
Positive predictive value	The percentage of children referred from screening who have a confirmed vision loss. For example, if 100 babies are referred from screening for diagnostic assessment and 10 have normal vision and 90 have a confirmed visual defect, the positive predictive value would be 90%.
Prevalence	The percentage or number of individuals with a specific disease or condition. Prevalence can either be expressed as a percentage or as a number out of 1000 individuals within the same demographic.
Programme	An organised system for screening, which could be based nationally, regionally or locally.
Protocol	Documented procedure or sequence for screening, which could include which tests are performed, when tests are performed, procedures for passing and referring, and so forth.
Quality assurance	A method for checking and ensuring that screening is functioning adequately and meeting set goals and benchmarks.
Referral criteria	A pre-determined cut-off boundary for when a child should be re-tested or seen for a diagnostic assessment.
Risk babies / Babies at-risk	All infants that are considered to be at-risk or have risk-factors for vision defects/ophthalmic pathology according to the screening programme.

	Two common risk factors are admission to the neonatal-intensive care unit (NICU) or born prematurely. However, other risk factors for visual defects may also be indicated in the screening programme.
Sensitivity	The percentage of children with visual defects that are identified via the screening programme. For example, if 100 babies with visual defects are tested, and 98 of these babies are referred for diagnostic assessment and 2 pass the screening, the sensitivity is 98%.
Specificity	The percentage of children with normal vision that pass the screening. For example, if 100 babies with normal vision are tested, and 10 of these babies are referred for diagnostic assessment and 90 pass the screening, the specificity is 90%.
Target condition	The visual defect you are aiming to detect via the screening programme.
Well, healthy babies	Infants who are *not* admitted into the NICU or born prematurely (born after a gestation period of less than 37 weeks).

2 Abbreviations

CDPC Centre for Disease Prevention and Control

Conv Convergence

EM Eye Motility

GDP Gross Domestic Product

GP General Practitioner

IOL Intraocular lens

NICU Neonatal-intensive care unit

NS Not specified

PPP Purchasing Power Parity

ROP Retinopathy of Prematurity

RR Red reflex

VA Visual acuity

WHO World Health Organisation

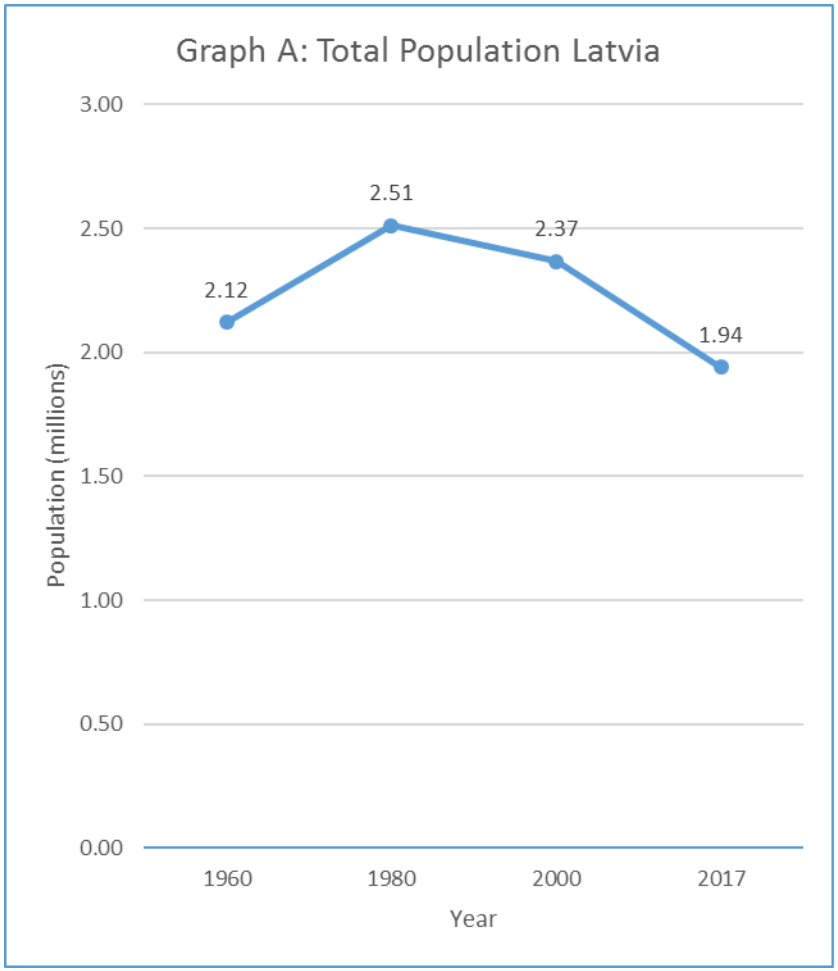
3 Population and Healthcare Overview

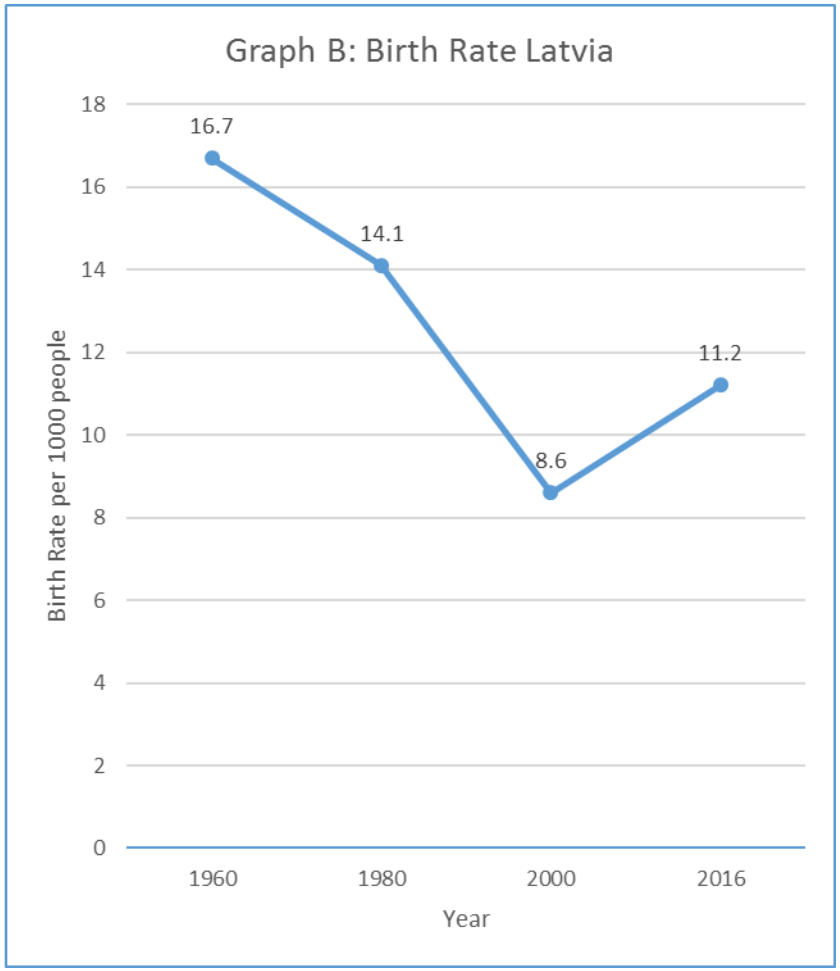
The population of Latvia is 1,940,740 (World Bank, 2018a) and birth rate is estimated at 11.2 births/1,000 population in 2016 (World Bank, 2018b). The change in population and birth rate from 1960 to 2017 is shown in Figure 1, graphs A and B respectively.

Latvia has a reported population density of 31 people per square kilometre in 2017 and this has fallen from 35 people per square kilometre in 1961 (World Bank, 2018c). In terms of healthcare facilities, the total density of hospitals in 2013 was 1.56 per 100,000 population (WHO, 2016a). Infant mortality in 2017 is estimated at 3.6 deaths/1,000 live births in total (World Bank, 2018d).

The average life expectancy in Latvia is estimated at 74.5 years (World Bank, 2018e), with a death rate of 14.6 deaths/1,000 population in 2016 (World Bank, 2018f). Latvia has a gross national income per capita (PPP int. $, 2013) of $22,000 (WHO, 2016b). The estimated total expenditure on health per capita in 2014 was $940 (Intl $) and the total expenditure on health in 2014 as percentage of GDP was 5.9% (WHO, 2016b).

Figure 1: Change in the Total Population and Birth Rate in Latvia between 1960 and 2017





Source: Information sourced from World Bank (2018)

4 Vision Screening Commissioning and Guidance

In Latvia, state-funded vision screening was introduced in 2013. It is embedded into a general preventative child healthcare screening system, the content of which is decided upon by the Ministry of Health in collaboration with healthcare professionals from the National Health Service and the professional body for ophthalmologists.

Vision screening is organised nationally, with no regional variation between protocols. In Latvia, the government pays for preventive eye examinations for each child, from birth to the year of reaching adulthood.

Vision screening guidelines are detailed in general national health screening guideline documentation. Vision screening for children is recommended at the age between 13 to 24 months, between 3 to 4 years, before attending school and again at the age of 6 to 7 years.

Since the restoration of independence in 1991, vision screening has been nationally implemented and since then the vision screening programme has not changed. The vision screening programme guidance is revisited dependent upon necessity or submitted proposals. Any revisions are decided upon by the Ministry of Health, in collaboration with the healthcare professionals from within the National Health Service. This collaboration is put into place to encourage cabinet regulation and state government adoption. There is no special budget for revisions. In December 2017 a group of paediatric Ophthalmologists from the Children's Clinical University Hospital submitted a suggestion for programme review details of which can be seen in Appendix 1.

Vision screening is conducted by ophthalmologists and general practitioners (GP) in hospitals, child healthcare centres, or private clinics. It is not known how many of these practitioners are involved in vision screening. There are other clinicians who could conduct vision screening if additional training was provided, including nurses and optometrists. Currently there is no specific training to perform vision screening, as it is part of the academic training for ophthalmologists. Every 5 years, medical professionals have to renew their medical practitioner certificate to be able to competently and independently engage in medical treatment.

The government does not provide methods of quality monitoring for vision screening and any information is collected by institutions via statistical reports of treatment within the Centre for Disease Prevention and Control (CDPC). It is not clear if there has been research conducted concerning the vision screening programme carried out in Latvia.

5 Screening programme

The target conditions screened for have not been defined; however, the purpose of vision screening is to provide a general examination. The health care professionals delivering vision screening, venue for screening and tests used vary depending on the age of the child as shown in Tables 1, 2 and 3 respectively. Specific details of the screening offered within each age group are described more fully in sections 5.1 to 5.4 below.

5.1 Vision screening - Preterm babies

It is not clear what eye screening tests are performed in preterm babies up to the age of 3 months. It is not clear what the sequence of these tests might be, or the pass criteria used for each test used. Any tests that are performed are conducted by an ophthalmologist in a hospital.

5.2 Vision screening - Birth to 3 months

Vision screening takes place at child healthcare centres, or at the GP practice, by a neonatologist, GP, paediatrician, or ophthalmologist. The vision screening tests conducted at this age include Bruckner test to assess for presence of strabismus, red reflex test, Hirschberg test, eye motility, cover/uncover test. Retinoscopy, slit lamp examination and ophthalmoscopy are performed under full cycloplegia.

If any of these tests show abnormalities, then they are referred to the Children's Clinical University Hospital Eye Disease Clinic.

5.3 Vision screening - 3 months to 36 months

In Latvia, children must have an eye examination at age of 13-24 months, 3 years and 6-7 years; this is specified in the law. Vision screening is conducted by paediatricians, ophthalmologists or a GP and this takes place at the GP practice or ophthalmological clinic. There are no defined criteria for what vision screening tests should be conducted in this age group. These tests and normative responses include:

- Bruckner test for presence of manifest strabismus and red reflex test. Normal reflexes should be the same bright, size in both eyes.
- Visual acuity (VA) with Cardiff or Teller cards at distance 100 or 50 cm, monocular and binocular condition. The test is passed if the VA is similar in both eyes.
- At 3 months of age VA should be 0.06-0.07 decimal (0.06 decimal = 1.22 logMAR, 6/95 Snellen), at 6 months 0.2 decimal (0.70 logMAR, 6/30 Snellen), 12 months 0.2-0.3 decimal (0.2 decimal = 0.70 logMAR, 6/30 Snellen). At 36 months 0.2-0.6 decimal or better (0.2 decimal = 0.70 logMAR, 6/30 Snellen). The test is passed if there is no difference between two eyes (two test lines) or the VA corresponds to the age of the child as outlined above.

- The oriented visual field test is passed if the child observes the object (for example, toy or clinician's fingers) equally with the right and left eyes on all sides.
- Stereovision may be checked from 6 months of age (Lang I and II tests)
- Hirschberg test is passed if no manifest deviation of the eyes
- The cover/uncover test is passed if child has orthophoria
- The eye motility test is passed if the child's eye muscles work symmetrically, with no muscle paralysis.
- Convergence test is passed if near point of convergence is 6-10 cm and recovery point of convergence is 12-15 cm.

The screening is passed if the specialist does not find abnormalities. It is not known how many inconclusive or abnormal test results necessitate referral for further examination.

5.4 Vision screening - 36 months to 7 years

There are no specific guidelines concerning which vision screening tests should be conducted on children aged 36 months to 7 years.

- Bruckner test for presence of manifest strabismus and red reflex test. Normal reflexes should be the same bright, size in both eyes.
- VA with Cardiff or Teller cards (at age of 36 months if child does not understand another test) with LEA tests (symbols, numbers), "E" test, Landolt "C" at the 3-6 m and 0.4 m. The test passed if VA is similar in both eyes and within normative expected responses as follows:
    - At age of 36 months children visual acuity is 0.2-0.6 decimal or better (0.2 decimal = 0.7 logMAR, 6/30 Snellen), at age of 4-5 years 0.5-0.9 decimal (0.5 decimal = 0.3 logMAR, 6/12 Snellen) or more, at age of 8 years 0.9-1.0 decimal or better (0.9 decimal = 0.05 logMAR, 6/7 Snellen)
    - The test passed if there is no difference between two eyes (two test lines) or if VA corresponds to the age of the child as outlined above.
- Visual field test by confrontation method, passed if the child observes the object that the specialist is showing equally monocularly with the right and left eyes on all sides.
- Stereovision can be measured by Titmus Fly, Animals, Rings test, TNO test, Lang I and II tests, Two-Pencil test
- Hirschberg test - no observed deviation of the eye/s
- Cover/uncover test passed if child has orthophoria only
- Eye motility test passed if a child's eye muscles work symmetrically, no muscle paralysis.
- Convergence test passed if child near point of convergence is 6-10 cm and recovery point of convergence is 12-15 cm.

Tests passed if the specialist does not find abnormalities. Vision screening is conducted by paediatricians, ophthalmologists, or a GP and this takes place at the GP practice or ophthalmological clinic. It is not known how many inconclusive or abnormal test results necessitate referral for further examination.

Table 1: Healthcare professionals who conduct vision screening in each age group

Table 1	**Neonatologist**	**Paediatrician**	**Ophthalmologist**	**GP**
Preterm babies	Not specified (NS)	NS	NS	NS
0 to 3 months	✓	✓	✓	×
3 to 36 months	×	✓	✓	✓
3 to 7 years	×	✓	✓	✓

Table 2: Vision screening tests used in vision screening for each age group

Table 2	**Eye examination**	**RR**	**EM**	**Hirschberg**	**Cover/ uncover**	**visual field**	**VA**	**Stereopsis**	**Conv**
Preterm babies	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
0 to 3 months	×	✓	✓	✓	✓	×	×	×	×
3 to 36 months	✓	✓	✓	×	✓	✓	✓	✓	✓
3 to 7 years	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 3: Location of vision screening for each age group

Table 3	Hospital	GP practice	Child healthcare centre	Ophthalmology clinic
Preterm babies	✓	×	×	×
0 to 3 months	×	✓	✓	×
3 to 36 months	×	✓	×	✓
3 to 7 years	×	✓	×	✓

6 Automated Screening

Automated vision screening is achieved using handheld, portable devices designed to detect presence of refractive error in infants from 6 months of age. It provides objective results and is used to detect amblyopic risk factors. This differs from other methods used to screen children for amblyopia which focus on detection of the actual condition and the resulting visual loss. There is no automated vision screening conducted in Latvia.

7 Provision for Visually Impaired

At the end of 2017, there were 478 patients on the visually impaired list (the list is kept in the Children's Clinical University Hospital Eye Disease Clinic). Every year the number of patients is updated. Children with vision problems go to specialised kindergartens. One such specialised kindergarten is located in Riga (Sapnudarzs). Families from other cities can leave their children for the whole week and pick them up for the weekend. Children are given five meals a day, morning and evening classes. After graduating from kindergarten (6-7 years old), children with visual problems can enrol in a specialised (Strazdumuizas) secondary school.

The costs per child for these schools is not available. The state pays for the prescription and purchase of optical appliances for the correction of VA deficits in these children and the also provides support for certain devices for vision correction. The costs for all children in 2016 are shown in Table 4.

Table 4: Cost of optical correction in schools for visually impaired children in 2016

Name of the vision correction device	**Delivered quantity**	**Euros**
Eyeglass frames (stainless steel, plastic, for children with special needs)	1,690	16,278,30
Plastic lenses for glasses (spherical, toric, bifocal, progressive, photochromic)	3,517	34,333,47
Contact lenses (soft (spherical, toric), rigid gas permeable)	929	15,004,31
Special contact lenses for infants and children up to five years of age	12	2,788,80
Total		**68,404,88**

8 Knowledge of existing screening programme

8.1 Prevalence/Diagnosis

There is no data collected and available relating to the prevalence of amblyopia and/or strabismus in Latvia.

8.2 Coverage

All children (100%) in the target group from 0 to 6 years of age are eligible to attend vision screening. In 2016 there were 169,296 eligible children. The GP invites the child for vision screening, this is done during the regular visits to the family doctor. There is no data collected and available relating to the coverage and treatment success of vision defects in Latvia. However, it is estimated that approximately half of newborn babies do not utilise the ophthalmologist consultation and only a third of children attended vision screening in older age groups.

8.3 Screening evaluation

There is no data relating to the number of false positive referrals, false negative referrals, positive predictive value, sensitivity of screening, or specificity of screening in Latvia.

8.4 Treatment success

Ophthalmologists are the only professionals in Latvia that prescribe glasses to children under the age of 7 years; glasses, patching, strabismus surgery and cataract surgery are all used in Latvia. All eligible children are offered treatment. Children are sent for treatment in the Children's Eye Diseases clinic in the Children's University Hospital. Here, children are treated for congenital and paediatric glaucoma with operative therapy by a glaucoma surgeon. Refraction, amblyopia and follow up is done by a paediatric ophthalmologist.

Preoperative examination and postoperative follow up is done by a paediatric ophthalmologist, cataract extraction with or without Intraocular lens (IOL) implantation is done by cataract and vitreous retinal surgeon. Strabismus operations are done by paediatric ophthalmologists in Children's Hospitals. In Latvia, operations are performed for strabismus in children and for adults. For strabismic children treatment for amblyopia always comes first, with glasses and patching. Children are prescribed glasses if they have refractive error and need them

9 Costs of vision screening in children

9.1 Cost of vision screening

The salary costs and other payments for healthcare services are calculated by taking into account average salary costs per month for doctors and functional specialists, this is 1,125.00 Euros.

The costs of training are described as:

- To qualify as an optometrist, specialists need to study for three years at bachelor level and two years at Masters level. The total cost of educations is 10,000 Euros (6,000 Euros for the bachelor degree and 4,000 Euros for the Masters degree).
- Training costs for a medicine degree lasting 6 years is dependent on the university; but this can vary from 2,820 Euros to 3,600 Euros per year. Ophthalmological residency lasts 4 years and vary from 3,000 Euros to 5,120 Euros per year. Ophthalmologist costs vary from 28,920 Euros to 42,080 Euros.
- Training costs for GPs can cost up to 36,960 Euros.

It is not known how much it costs to train other clinicians who carry out vision screening from leaving secondary education to qualification.

The total screening costs per year for vision screening is estimated at 527,600 Euros, this is approximated to 19 Euros per child. A vision examination during screening, for one child, costs 9.69 Euros, 40% of which goes to doctor. The salary will depend on how many patients the doctor examines. In Latvia, vision screening is free of charge for parents. There are no penalties for non-attendance or reward for attending vision screening. Before attending any educational institutions (kindergarten or school), parents have to submit copies of their child's documents and medicine card which needs to document information about the child's health. There are large waiting lists (up to 150 days) and therefore children are not always seen before they attend kindergarten or school.

9.2 Cost of treatment for amblyopia

There is no data available regarding the costs of treating children with amblyopia.

9.3 Cost of Treatment for strabismus

There is no data available regarding the costs of treating children with strabismus.

9.4 Cost of treatment for cataract

There is no data available regarding the costs of treating children with cataract.

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Appendix 1: Content of submitted (26/12/2017) suggestion for programme review

Submitted by: Paediatric ophthalmologists from Children's Clinical University Hospital

1. A neonatologist and family doctor or paediatrician examine red reflex 1 day after the birth, at 2 weeks and every month until 1 year of age.
2. An ophthalmologist should only screen at age 1 year (8 months-20months) babies who are at risk. Family doctors could conduct the screening on at risk children but must refer them to an ophthalmologist. An ophthalmologist should screen using Cardiff cards, examine strabismus, and conduct cycloplegic refraction using a retinoscope.
3. At age of 3-4 years, all children should have been screened by an optometrist or ophthalmologist. The tests should be vision with right and left eye, strabismus examination, cycloplegic refraction, and fundus & media examination). If the child has not passed the examination, an optometrist or ophthalmologist should send these children for examination to an ophthalmologist.
4. At age of 6-7 years, all children should have been screened by an optometrist.