Summary Vision Screening Data: Lithuania

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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

ACT Alternating Cover Test

AS Automated Screening

BT Bagolini Test

CT Cover Test

CV Colour Vision

EI Eye Inspection

EM Eye Motility

Fix Fixation

GDP Gross Domestic Product

GP General Practitioner

Hir Hirschberg test

NICU Neonatal-intensive care unit

PCT Prism Cover Test

PM Pursuit Movements

PPP Purchasing Power Parity

PR Pupillary Reflexes

RE Retinal Examination

Ret Retinoscopy

ROP Retinopathy of Prematurity

RR Red Reflex Testing

VA Visual Acuity

WHO World Health Organisation

WT Worth Test

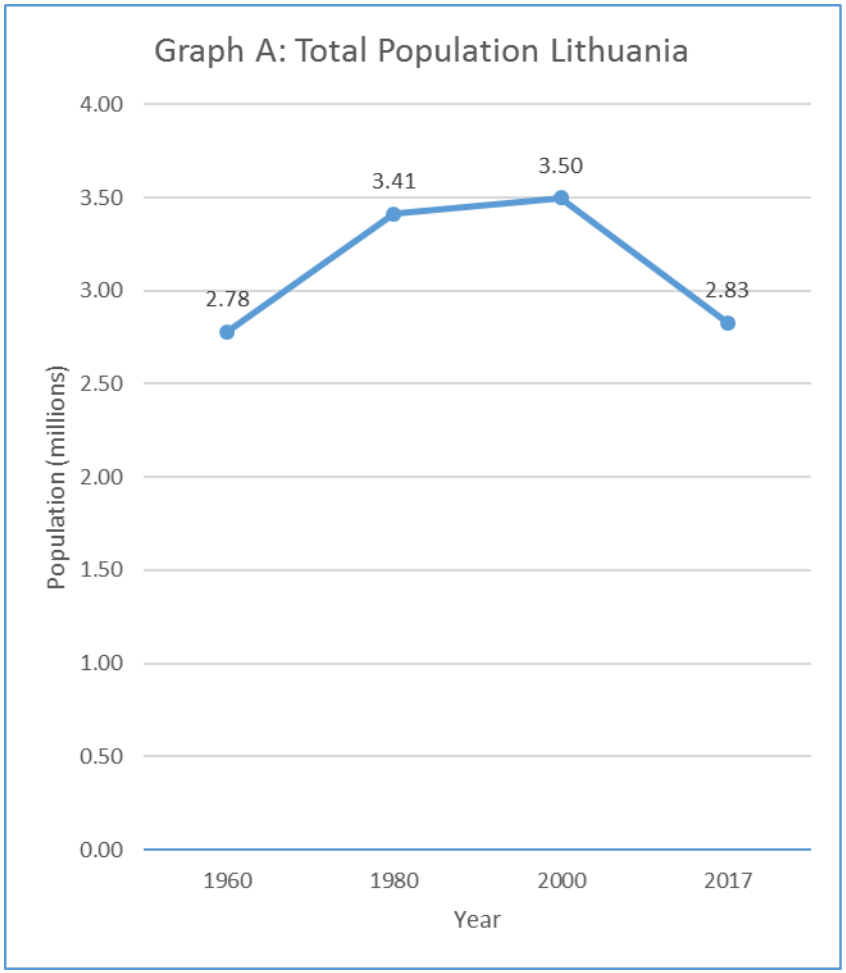
3 Population and Healthcare Overview

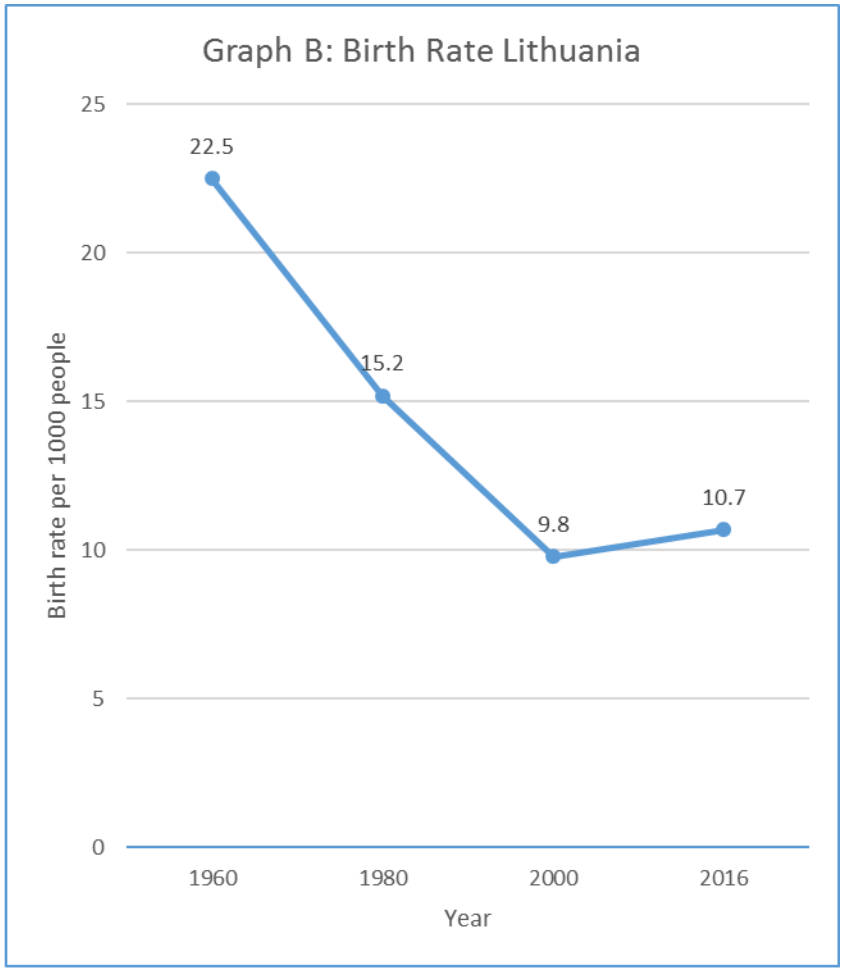
The population of Lithuania is 2,827,721 (World Bank, 2018a) and a birth rate estimated at 10.7 births/1,000 population in 2016 (World Bank, 2018b). The change in population and birth rate from 1960 to 2017 is shown in Figure 1, graphs A and B respectively.

Lithuania has a reported population density of 45.14 people per square kilometre in 2017 and this has risen from 45.05 people per square kilometre in 1961 (World Bank, 2018c). In terms of healthcare facilities, the total density of hospitals in 2013 was 2.15 per 100,000 population (WHO, 2016a). Infant mortality in 2017 is estimated at 3.4 deaths/1,000 live births in total (World Bank, 2018d).

The average life expectancy in Lithuania is estimated at 74.3 years (World Bank, 2018e), with a death rate of 14.3 deaths/1,000 population in 2016 (World Bank, 2018f). Lithuania has a gross national income per capita (PPP int. $, 2013) of $24,000 (WHO, 2016a). The estimated total expenditure on health per capita in 2014) was $1,718 (Intl $) and the total expenditure on health in 2014 as percentage of GDP was 6.5% (WHO, 2016b).

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





Source: Information sourced from World Bank (2018)

4 Vision Screening Commissioning and Guidance

Vision screening is organised nationally in Lithuania, with no regional variation regarding vision screening protocols. Vision screening is funded by the state and the programme provided is embedded into a general preventative child health care system. It is unknown who decides upon the content of the vision screening programme and it is unknown what year the vision screening programme commenced. However, the vision screening programme has been expanded since its commencement. Specifically, it has been extended for all newborn babies whereby red reflex testing is obligatory.

There are no guidelines for vision screening and it is unknown how often the programme is reviewed, who decides on revisions, how often these revisions take place, and how often there is funding for revisions. There are no measures for quality monitoring of vision screening imposed by the government and there is no research pertaining to the clinical or cost-effectiveness of the vision screening programme.

In Lithuania, the professionals that perform vision screening are paediatricians, family doctors (GPs), ophthalmologists and nurses. Vision screening in conducted in hospitals, private clinics and 'other' clinics (defined as policlinics). Health care services are divided into three levels in Lithuania: Level one - family doctors; Level two – specialists; Level three - university hospitals. The vision screening is performed in all levels, however, it should not be performed in the third level theoretically, but in practice it is done.

It is unknown how many vision screening professionals are practicing in Lithuania. It is stated by the Country Representative (CR) that there are probably some nurses who could be considered as general professionals that do not screen, but could do so with additional training. However, there is no specific training provided for vision screening professionals.

5 Screening programme

Vision screening is compulsory in Lithuania at the age of 7 years old, prior to this age, only fundus red reflex is performed as a requirement at birth. Retinopathy of prematurity, congenital eye disorders and amblyopia are the target conditions screened for in Lithuania. 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 Preterm vision screening

Preterm babies are screened using a retinal examination. This is conducted in hospital by an ophthalmologist. Retinal examination is conducted for the premature infants weighing less than 2000g or those born before 33 weeks of gestation. Preterm vision screening for babies born before 26 weeks is performed after the 31 week of the adjusted age. Babies born on or after 27 weeks of gestation are screened 4 weeks after birth.

5.2 Vision screening - Birth to 3 months

Well, healthy babies up to the age of 3 months are screened once using red reflex testing. This is conducted within the first few days of birth, at the hospital, by either a paediatrician, nurse, ophthalmologist, neonatologists, or obstetricians. Babies are immediately referred for further examination if the test result is abnormal, or inconclusive. Strabismus also necessitates referral for further diagnostic examination. Vision screening may be repeated, before referral for further diagnostic examination, based on the discretion of the doctor.

5.3 Vision screening - 3 months to 36 months

Children aged 3 to 36 months are tested in family clinics, both public and private, in specialist consulting rooms and university hospitals. This is conducted by an ophthalmologist using eye inspection, fixation, red reflex testing, eye motility, Hirschberg test, retinal examination, pursuit movements, pupillary reflexes, cover test, alternating cover test, visual acuity measurement, stereopsis (Lang Stereo Test I and II), colour vision and automated screening. These tests are performed between 1 and 3 years of age, over the course of one visit. The disparity between years at which tests are performed is down to there being no unified vision screening calendar, therefore the age at which vision screening takes place is dependent upon the family doctor or the wish of the parents. There are no set referral criteria, the screening is dependent upon the “abilities and competence” of the ophthalmologist and the cooperation of the child. Strabismus also necessitates referral for further diagnostic examination. Vision screening is repeated, before referral for further diagnostic examination based on the discretion of the doctor.

5.4 Vision screening - 36 months to 7 years

Children aged 36 months to 7 years are also tested in the predefined policlinics using eye inspection, fixation, red reflex testing, eye motility, Hirschberg test, retinal examination, pursuit movements, pupillary reflexes, cover test, alternating cover test, visual acuity measurement, stereopsis (Lang Stereo-test I and II, Stereo Fly test, Stereo Randot test, Stereo Butterfly test), colour vision, autorefraction (Retinomax) and automated screening (PlusOptix). These tests are performed by either an ophthalmologist, paediatrician, or GP. However, paediatricians and GPs are only able to check visual acuity using the Snellen chart as they do not have any other tests or equipment for vision screening in their consulting rooms. The referral criteria for visual acuity for children under the age of 7 years is just approximate and there are no regulated rules for it. Strabismus also necessitates referral for further diagnostic examination. Vision screening is repeated, before referral for further diagnostic examination based on the discretion of the doctor.

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

Table 1	Paediatrician	Ophthalmologist	Nurse	Neonatologist	Obstetrician	GP
Preterm babies	×	✓	×	×	×	×
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	EI	Fix	RR	EM	Hir	RE	PM	PR	CT	ACT	VA	SV	CV	AR	AS
Preterm babies	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	×
0 to 3 months	×	×	✓	×	×	×	×	×	×	×	×	×	×	×	×
3 to 36 months	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3 to 7 years	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

KEY: EI: Eye inspection; Fix: Fixation; RR: Red reflex testing; EM: Eye motility; Hir: Hirschberg; RE: Retinal examination; PM: Pursuit movements; PR: Pupillary reflexes; CT: Cover test; ACT: Alternating cover test; VA: Visual acuity measurement; SV: Stereopsis; CV: Colour vision; AR: Autorefraction; AS: Automated screening.

Table 3: Location of vision screening for each age group

Table 3	**Hospital**	**Family clinic**	**Specialist Consulting Room**	**Policlinic**
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.

The PlusOptix automated screening device and the Retinomax autorefractor are used for vision screening in parts of Lithuania and is completed both with and without cycloplegia. What is classed as an abnormal result at each age group is decided by each individual ophthalmologist.

It is unknown how much is spent on these devices in terms of the cost to purchase the machine, nor the cost of maintaining the equipment. It is also not known after how many years the devices require replacing. Plusoptix and autorefractometers are located at the policlinics. There are two Plusoptix devices and two autorefractors at the third level institution within the Children‘s Hospital, Affiliate of Vilnius University Hospital Santaros Klinikos. Unfortunately, it is not possible to determine how many devices there are at all other clinics or in other regions.

7 Provision for Visually Impaired

In Lithuania, there are two schools for blind or severely impaired children. These schools are state-owned, and it is unknown what the costs are per child. Visually impaired children, determined using criteria by the Lithuanian Ministry of Health, who attend regular mainstream primary school receive financial support in the way of approximately 34 Euros (for those with significant/defined impairment) per year for glasses.

8 Diagnostic Outcomes

8.1 Prevalence/Diagnosis

The prevalence of treated or untreated amblyopia in Lithuania is unknown, as is the prevalence of persistent amblyopia and/ or strabismus by age 7 years. There are no data available regarding incidence of the four types of amblyopia (strabismic, refractive, combined mechanism and deprivation) per age per year in Lithuania.

8.2 Coverage

There is no protocol for vision screening available for Lithuania and it is unknown what percentage of children are invited for vision screening. This invitation is provided by the family doctor via telephone using either an opt-in or opt-out method and it is not compulsory to attend. Visual acuity screening is compulsory before school age is reached at age 7 years. There are no data regarding the coverage of vision screening before the age of 7 years, but this number is expected to be 100%. The percentage of children who attend the referral appointment after an abnormal screening test is unknown.

8.3 Screening evaluation

There is no information regarding the percentage of false negative or false positive referrals subsequent to vision screening. The positive predictive value of a refer result after vision screening is not known, neither is the sensitivity of vision screening in Lithuania. There are no data pertaining to the specificity of vision screening, Lithuania is not collecting data in these areas.

8.4 Treatment success

There are no data pertaining to the percentage of infants treated for congenital eye disorders, or the percentage of children treated for strabismus or amblyopia after being screened before 7 years of age. Subsequent to referral from screening, ophthalmologists are the only professionals that prescribe glasses for children aged less than 7 years. Further treatment options, are comprised of patching, glasses for refractive error, penalisation with glasses, atropine and cataract surgery. Not all eligible children with vision disorders are treated, often due to undetected vision problems. This could be due to missed screening appointments which encompasses a number of factors including: no time, no transport, the distance to travel to the policlinic is far away, no perceived need by the parents, the doctor may not have free visit times or the waiting for a visit is too long.

9 Costs of vision screening in children

In Lithuania, vision screening is free for parents and there are no financial rewards for parents when children attend vision screening. Furthermore, there are no penalties for parents when children do not attend vision screening.). There is no system implemented to determine whether or not vision screening is actually completed. There is no electronic data system that details how many children completed vision screening, or indeed what the result of the vision screening was.

9.1 Cost of vision screening

The salary costs per year for vision screening professionals is estimated at 10,000 Euros, with an estimated salary per hour of 5 Euros. It is not known how much it costs to train the general preventative child health care screening professionals between leaving secondary education to qualification. It is not known what the total screening costs are per year, or per child per year for vision screening in Lithuania.

9.2 Cost of treatment for amblyopia

The costs for treatment of typical patients with refractive amblyopia and strabismic amblyopia, including follow up, are not known.

9.3 Cost of Treatment for strabismus

The costs for treatment of strabismus surgery, including follow up, are not known.

9.4 Cost of treatment for cataract

The costs for treatment of congenital cataract surgery, including follow up of deprivation amblyopia, are not known.

10 References

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