



Summary Vision Screening Data: Romania

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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	<p>The proportion of all those invited for screening that are tested and receive a result:</p> <ul style="list-style-type: none"> • 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”. <p>Attendance rate provides information on the willingness of families to participate in screening.</p>
Compliance with referral (percentage)	<p>The percentage of those who are referred from screening to a diagnostic assessment that actually attend the diagnostic assessment.</p> <p>Percentage of compliance provides information on the willingness of families to attend the diagnostic assessment after referral from screening.</p>
Coverage	<p>The proportion of those eligible for screening that are tested and receive a result:</p> <ul style="list-style-type: none"> • 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”. <p>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.</p>
False negatives	<p>The percentage of children with a visual deficit (defined by the target condition) that receive a result of “pass” during screening.</p> <p>Example: If 100 children with visual deficit are screened, and 1 child passes the screening, the percentage of false negatives is 1%.</p>



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	<p>The percentage of children referred from screening who have a confirmed vision loss.</p> <p>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%.</p>
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	<p>The percentage of children with visual defects that are identified via the screening programme.</p> <p>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%.</p>
Specificity	<p>The percentage of children with normal vision that pass the screening.</p> <p>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%.</p>
Target condition	The visual defect you are aiming to detect via the screening programme.
Well, healthy babies	Infants who are <i>not</i> admitted into the NICU or born prematurely (born after a gestation period of less than 37 weeks).



2 Abbreviations

ACT	Alternating Cover Test
AR	Autorefraction
AS	Automated Screening
CT	Cover Test
CV	Colour Vision
EI	Eye Inspection
EM	Eye Motility
Fix	Fixation
GDP	Gross Domestic Product
GP	General Practitioner
Hir	Hirschberg
NICU	Neonatal-intensive care unit
PM	Pursuit Movements
PPP	Purchasing Power Parity
PR	Pupillary Reflexes
RE	Retinal Examination
ROP	Retinopathy of Prematurity
RR	Red Reflex Testing
SV	Stereopsis
VA	Visual Acuity
WHO	World Health Organisation



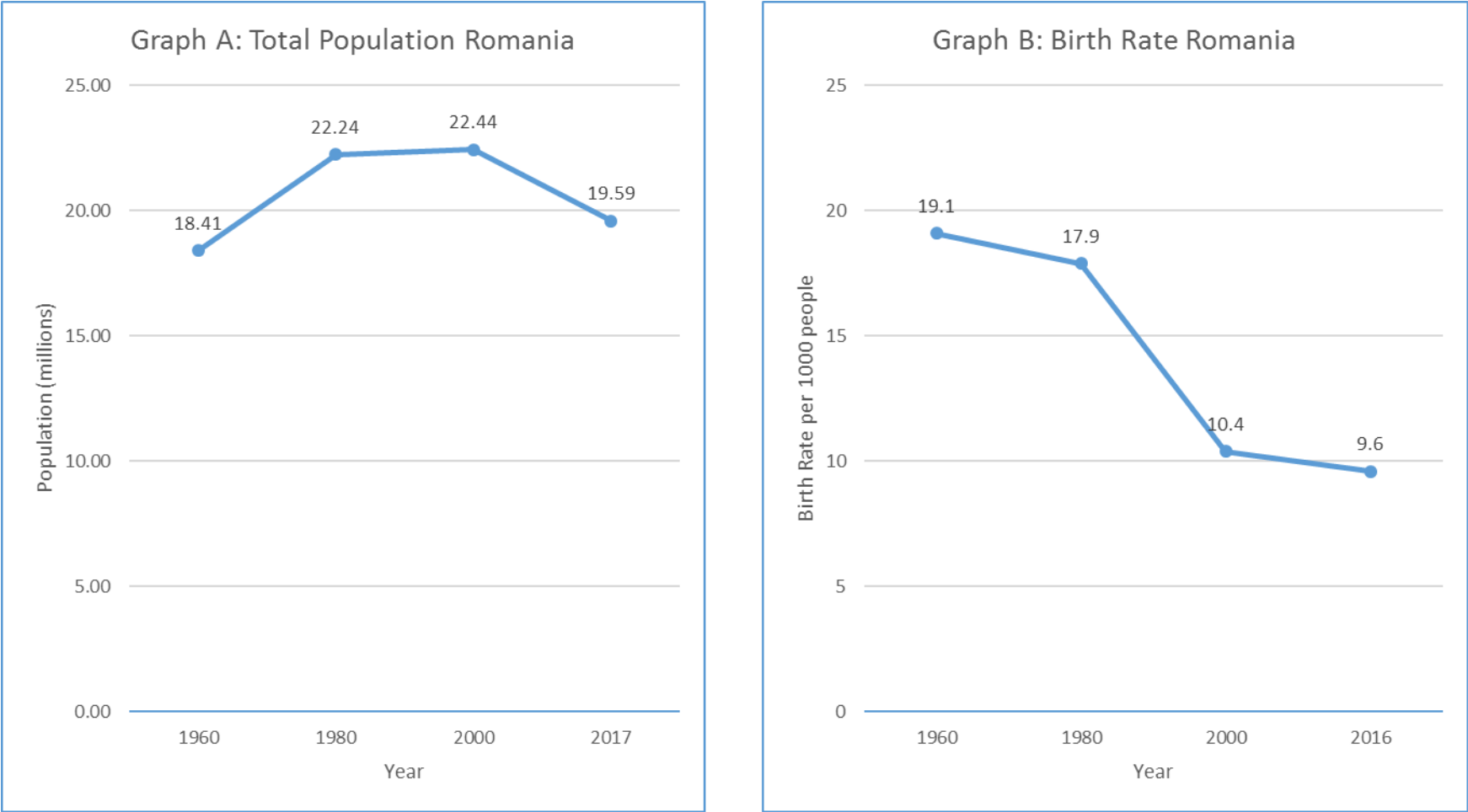
3 Population and Healthcare Overview

The population of Romania is 19,586,539 (World Bank, 2018a) and birth rate is estimated at 9.6 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.

Romania has a reported population density of 85 people per square kilometre in 2017 and this has risen from 81 people per square kilometre in 1961 (World Bank, 2018c). In terms of healthcare facilities, the total density of hospitals in 2013 was 1.68 per 100,000 population (WHO, 2016a). Infant mortality in 2017 is estimated at 6.6 deaths/1,000 live births in total (World Bank, 2018d).

The average life expectancy in Romania is estimated at 75 years (World Bank, 2018e), with a death rate of 13 deaths/1,000 population in 2016 (World Bank, 2018f). Romania has a gross national income per capita (PPP int. \$, 2013) of \$18,000 (WHO, 2016b). The estimated total expenditure on health per capita in 2014 was \$1,079 (Intl \$) and the total expenditure on health in 2014 as percentage of GDP was 5.6% (WHO, 2016b).

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



Source: Information sourced from World Bank (2018)

4 Vision Screening Commissioning and Guidance

Vision screening in Romania is organised regionally, by the local Lions Clubs. The local Lions Clubs vary according to the region of the country where they are situated, they offer screening in different regions of the country periodically. Screening is offered to children enrolled in state funded kindergartens. There are no differences in protocols operating in each region. In Cluj, vision screening was implemented in 2012 and this ended in 2014; this was the end of the periodic vision screening for this area. In 2012, screening was offered to children enrolled in state-funded kindergartens between the ages of 3 to 6 years. It is estimated that this was the first vision screening offered for this age group.

Retinopathy of prematurity (ROP) screening was implemented in 2002 and is ongoing in the counties where there are medical universities, for instance in Bucharest, Lasi, Cluj and Timisoara. The rest of the counties do not provide ROP screening and instead, each region must rely on periodic vision screening to occur in their respective region. To date, it is estimated that vision screening has been organized by local Lions Clubs in Cluj, Timis, Mures, Arad, Bihor, Vaslui, Prahova, Bacau, Calarasi, Bucuresti, Iasi, Brasov, Sibiu, Hunedoara and Constanta.

The periodic vision screening is funded through charities and university grants with these programmes embedded into a general preventative child healthcare screening system. The content of these vision screening programmes is decided upon by the Lions Club and by a University.

Ophthalmologists conduct vision screening; these professionals go into kindergartens to perform the periodic vision screening. It is estimated that there are less than one ophthalmologist per million population. Nurses and optometrists have been identified as general professionals who do not screen, but could do so with additional training. However, there is currently no specific training available to perform vision screening.

Vision screening takes place in hospitals, child healthcare centres, or kindergartens. The vision screening programme for ROP changed since its implementation when in 2004 it was extended to the entire country. ROP screening is carried out in cities with medical universities and those that have a specialist and the necessary equipment. All children who meet the criteria are screened for ROP. Children from counties with no ROP specialist are referred to the next available ROP screening centre. There are national general vision screening guidelines.

There is no defined mechanism for revision and review of vision screening programmes in terms of frequency, personnel to perform it or funding. The government has not implemented quality monitoring of vision screening and no other mechanism for this is in place; any information collected is reported on an individual basis by the screening personnel. There has been no research concerning the vision screening programmes, no cost-effectiveness analysis, or any other studies on the effectiveness of vision screening programme in Romania.

5 Screening programme

The targets conditions for vision screening are reduced visual acuity (VA), refractive error, strabismus and ROP. 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

Preterm babies aged up to 3 months are screened by ophthalmologists in neonatology departments, NICUs, Premature Health Care Centres, or Ophthalmology departments for babies discharged home. The tests used are red reflex testing, Hirschberg test, retinal examination and pupillary reflexes.

5.2 Vision screening - Birth to 3 months

Well, healthy babies up to the age of 3 months are screened by either a paediatrician, or general practitioner (GP) at either a hospital, child healthcare centre, the child's home or GPs office. At birth, in the neonatology department an eye inspection and pupillary reflex are performed by the neonatologist. After discharge, the GP performs regular general exams at one month intervals. Part of the general examination is eye inspection, pursuit movements and pupillary reflexes. Ophthalmologists perform fundus red reflex testing if a child is referred. Referral is initiated when the paediatrician/neonatologist or GP detect an abnormality during the eye inspection, pursuit movements, or pupillary reflexes. Referral criteria include white pupil, manifest strabismus, nystagmus, evident abnormalities of the eye and surrounding structures (e.g. eye lids), absent pupillary reflexes or no pursuit movement after the age of two months. The child is then immediately referred to an ophthalmologist where further diagnostic tests are carried out. These include automated screening (PlusOptix), red reflex, retinal examination, cover test and an intraocular pressure (IOP) measurement (depending on the findings during the examination). The parents can also request for their child to be seen by an ophthalmologist, irrespective of the result from the GP or paediatrician. If insufficient cooperation is impeding a diagnosis, then an examination is performed under inhalator sedation of the baby.

5.3 Vision screening - 3 months to 36 months

No vision screening programmes are currently available in Romania for children of pre-kindergarten age, between 3 months and 36 months.

5.4 Vision screening - 36 months to 7 years

Children aged between 36 months and 7 years are screened by an ophthalmologist in kindergarten. This is dependent on whether or not the specific region is benefitting from periodic organised vision screening. Therefore, this screening may take place once and this

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age, more than once, or not at all. Tests conducted are eye motility, pursuit movements, cover test, alternating cover test, visual acuity measurement and automated vision screening (PlusOptix). After one inconclusive test, the child is referred to an ophthalmologist for a further consultation. Referral criteria for children aged 36 months to 7 years are reduced VA, 0.2 logMAR (0.63 decimal, 6/9.5 Snellen) with 2-line difference, positive cover test (manifest or latent strabismus), or refractive error (hyperopia >3 Dioptres; myopia, astigmatism >1 Dioptres) and/or anisometropia. Visual acuity is tested using a Tumbling E chart, in logMAR, using both crowded and individual optotype cards, with a range of 0.1 – 1.0 at 5 metres. VA measurement is always performed by an ophthalmologist, and this is done for the first time with children aged 3 years. It is not known if a second measurement of visual acuity is taken, and if it is, at what age (as this depends on whether another screening episode takes place).

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

Table 1	Ophthalmologist	Paediatrician	GP
Preterm babies	✓	×	×
0 to 3 months	✓	✓	✓
3 to 36 months	×	×	×
3 to 7 years	✓	×	×

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

Table 2	EI	RR	EM	Hir	RE	PM	PR	CT	ACT	VA	AS
Preterm babies	x	✓	x	✓	✓	x	✓	x	x	x	x
0 to 3 months	✓	✓	x	x	x	✓	✓	x	x	x	x
3 to 36 months	x	x	x	x	x	x	x	x	x	x	x
3 to 7 years	x	x	✓	x	x	✓	x	✓	✓	✓	✓

Key: EI: Eye Inspection; RR: Red Reflex Testing; EM: Eye Motility; Hir: Hirschberg test; RE: Retinal Examination; PM: Pursuit Movements; PR: Pupillary Reflexes; CT: Cover Test; ACT: Alternating Cover Tests; VA: Visual Acuity; AS: Automated Screening

Table 3: Location of vision screening for each age group

Table 3	Hospital	Hospital	Kindergarten	Child Healthcare Centre	Parents Home	GPs Office
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.

In Romania, the PlusOptix device is used. It is estimated that the device costs between 6000 and 8000 Euros. The maintenance costs for this device are not known. Devices are only replaced when it is no longer functional or accurate.

Autorefractors, such as PlusOptix, are used for both screening and consultation with uncooperative children. For screening, this device has been used for all children who were screened in kindergarten by the organised periodic Lions Club campaign. It is used on all children who are being screened, independent of age and whether or not they are borderline/fail on the VA test. It is used in combination with VA measurement and cover test and the referral criteria are said to be based on common sense/professional opinion, with no specific guidelines. For example the criteria may be considered as hypermetropia >3 Dioptres, myopia or astigmatism and anisometropia > 1 Dioptres. If the PlusOptix is used with a VA test and the child passes a VA test, but fails on a PlusOptix, the child still is referred.

7 Provision for Visually Impaired

In Romania, there are 7 schools for the blind or severely visually impaired children. These schools are located in Bucharest (two schools), Arad, Cluj-Napoca, Buzau, Timisoara and Targu Frumos. The number of children attending these schools is not known exactly, however classes usually comprise of about 6 to 8 children, and cater for children from kindergarten to high school level. The costs per child for these schools are not known. There is no special support for visually impaired children, such as magnifying glasses, who attend regular mainstream state schools.

8 Knowledge of existing screening programme

8.1 Prevalence/Diagnosis

There is no data available concerning the prevalence of strabismus or amblyopia in children aged up to 7 years.

8.2 Coverage/

There is no data available concerning the percentage of children who are invited for vision screening. When vision screening is carried out by the Lions Club in kindergartens, a notification letter or email is sent to the parents who must give their consent for the screening. There is no data to document the coverage, attendance or outcomes of any vision screening completed before the age of 7 years.

8.3 Screening evaluation

There is no data available regarding the efficacy of the screening methods and tools used in Romania for children aged up to 7 years.

8.4 Treatment success

All eligible children are offered treatment. Ophthalmologists are the only professionals who prescribe glasses to children under the age of 7 years. Other treatment options include patching, penalisation with glasses, cataract surgery and strabismus surgery, where appropriate.

9 Costs of vision screening in children

9.1 Cost of vision screening

Vision screening professionals (including ophthalmologists, GPs, paediatricians and neonatologists) earn approximately 8000 Euros per year, with an hourly rate of approximately 4.80 Euros. There is no profession-specific salary information. It is not known how much it costs to train vision screening professionals in Romania, from leaving secondary education to qualification. The total screening costs per year for vision screening are estimated at 38820 RON (approx. 8627 Euro, 20/12/2018) for the county of Cluj per year for the visual screening done by the Lions Club; this equates to 9.8 RON (2.11 Euros, 20/12/2018) per child. This is the cost that resulted per child from the screening of kindergarten aged children in Cluj. It includes VA, PlusOptix and cover-test examinations.

9.2 Cost of treatment for amblyopia

The estimated costs for treatment of typical patients, with refractive amblyopia and strabismic amblyopia, including follow up, is said to be highly variable and dependent upon the degree of amblyopia. A visit in an ophthalmology private clinic costs the patient around 30 Euros. For a visit in the state clinic, the state reimburses the clinic with approximately 20 to 25 Euros for a consultation. Approximately 10 consultations are necessary. If surgery is required, the state reimburses the ophthalmology state clinic with 80 Euro for every hospitalisation day. Every patient requires approximately 3 days of hospitalisation (a total of 240 Euros). In a private clinic, strabismus surgery costs 800-1000 Euros.

9.3 Cost of Treatment for strabismus

The estimated costs for strabismus surgery, including follow up, are estimated at 400 Euros in the state clinic (children are entitled to free treatment in the state clinic) and around 1100-1400 Euros in a private clinic.

9.4 Cost of treatment for cataract

The estimated costs for congenital cataract surgery, including follow up of deprivation amblyopia, is estimated at 800 to 1000 Euros in the state clinic and 1500 Euros in a private clinic. Vision screening is free of charge for parents, but they can opt to pay for private clinics. There is no financial reward for parents whose children do attend their vision screening appointment, nor is there a penalty for those who do not. Vision screening is not obligatory.

10 References

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