



Summary Vision Screening Data: Turkey

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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.



	<p>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.</p>
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	<p>The visual defect you are aiming to detect via the screening programme.</p>
Well, healthy babies	<p>Infants who are <i>not</i> admitted into the NICU or born prematurely (born after a gestation period of less than 37 weeks).</p>



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

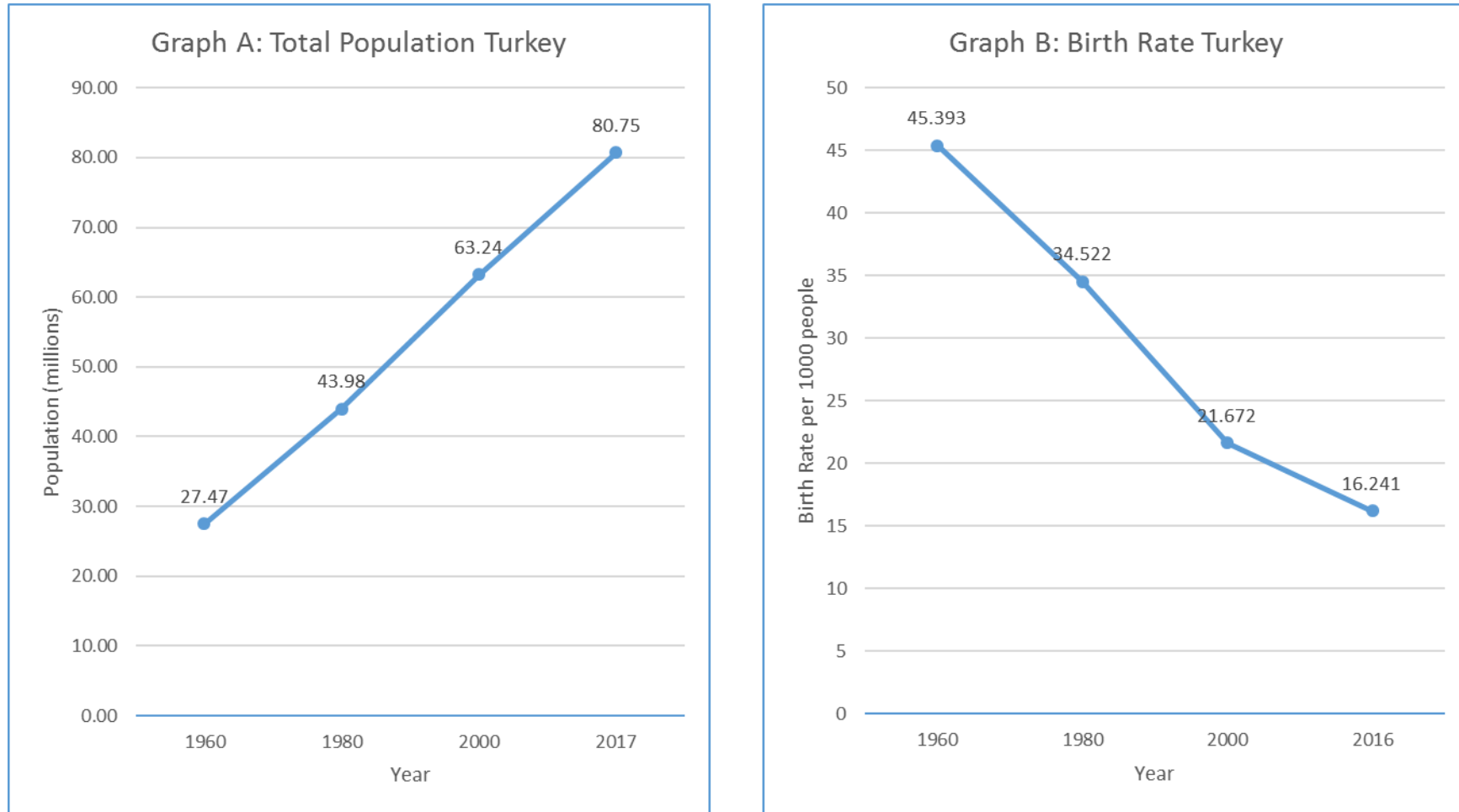
The population of Turkey is 80,745,020 (World Bank, 2018a) and birth rate is estimated at 16.24 births/1,000 population in 2016 (World Bank, 2018b). The change in population and birth rate from 1960 to 2017 is shown in Figure 1, graphs A and B respectively.

Turkey has a reported population density of 105 people per square kilometre in 2017 and this has risen from 37 people per square kilometre in 1961 (World Bank, 2018c). In terms of healthcare facilities, the total density of hospitals in 2013 was 1.55 per 100,000 population (WHO, 2016a). Infant mortality in 2017 is estimated at 10 deaths/1,000 live births in total (World Bank, 2018d).

The average life expectancy in Turkey is estimated at 75.76 years (World Bank, 2018e), with a death rate of 5.9 deaths/1,000 population in 2016 (World Bank, 2018f). Turkey 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 \$1,036 (Intl \$) and the total expenditure on health in 2014 as percentage of GDP was 5.4% (WHO, 2016b).



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



Source: Information sourced from World Bank (2018)



4. Vision Screening Commissioning and Guidance

In Turkey, vision screening is conducted primarily by family practitioners (GPs) and paediatricians, however, parents can opt to pay for their child to see an ophthalmologists. The vision screening programme began and was implemented nationally in 2015. The content of the screening programme was decided by the Ministry of Public Health Department following consultation with the Turkish Ophthalmological Association. Vision screening is organised nationally, with no known regional variation in protocols. However, variation is possible due to the fact that there are no methods for vision screening to be monitored by the government. At present vision screening is not embedded in a general preventative child health care screening system. Vision screening is funded by health insurance and the state, however if parents are willing to pay, they can opt to have their child assessed by an ophthalmologist.

Examinations take place in hospitals, private clinics, or at the offices of GPs. Currently, midwives and nurses do not undertake vision screening, but could do so following additional training. All GPs complete a one-day training programme in order to perform vision screening. During this one day programme, a didactic course about the screening programme and the red reflex test is given by two ophthalmologists during a morning session. A practical course is then given by the same ophthalmologists in the afternoon. Paediatricians are trained during residency; this includes lectures by ophthalmologists. Competencies for GPs and paediatricians are not checked. Regular education and statistical analysis are undertaken to update, monitor and revalidate the training programme. However, the training is not accredited or certified.

Current guidelines have not been revisited since its implementation. However, a review of any guidelines would be the responsibility of the Ministry of Health. The Ministry of Health Statistics department collects information, but this is not accessible. To date, there has been no research conducted in Turkey evaluating the vision screening programme and there has been no analysis into cost-effectiveness.



5. Screening programme

GPs follow the population in their area and as a part of the infant-child follow up programme, the follow-ups and the vaccinations are conducted by the GP. However, some families prefer to be followed by paediatricians, in this case the GP still has to follow the child and should confirm completion of the screening programme and the vaccinations and ask information from the family about the tests or vaccinations.

The target conditions for vision screening at the age of 3 months of age are structural anomalies, cataracts and strabismus. Target conditions in children aged 3 months to 7 years have not been defined. 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*

The vision screening tests performed in preterm babies up to 3 months of age are eye inspection, red reflex testing, Hirschberg test, retinal exam and pupillary reflexes. Vision screening is conducted at the GPs office, paediatrician's office or at the hospital. All tests are carried out by a paediatrician or GP unless parents opt to take their child to an ophthalmologist. If a child is found to have an abnormal screening result, they are referred for diagnostic testing. If the results of the screening tests are inconclusive, or if there is insufficient cooperation, the child is also referred for diagnostic testing. All children who fail vision screening at this age are referred to an ophthalmologist. Referral is based on asymmetric or absence of red reflex, structural anomaly, family concern about strabismus, family history of high refractive errors or strabismus or other ocular diseases like cataracts.

5.2 *Vision screening - Birth to 3 months*

The vision screening tests conducted in well, healthy babies up to the age of 3 months include eye inspection, red reflex testing, Hirschberg test and pupillary reflexes. Vision screening for children of this age is conducted at the Child Health Centre, GPs office, or paediatrician's office. All tests are carried out by a paediatrician or GP unless parents opt to take their child to an ophthalmologist. If a child is found to have an abnormal screening result, then they are referred to an ophthalmologist for diagnostic testing. If the results of the screening tests are inconclusive, or if there is insufficient cooperation, the child is also referred for diagnostic testing. The criteria for referral and diagnostic testing includes asymmetric or absence of a red reflex, structural anomaly, family concern about strabismus, family history of high refractive error, strabismus or other ocular conditions (e.g. cataract).

5.3 *Vision screening - 3 months to 36 months*

It is recommended that a red reflex examination is performed at every visit between the ages of 3 months and 36 months if a child visits a GP or a paediatrician. Parents can opt to pay for assessments by an ophthalmologist, and in this instance, tests would include normal eye inspection, eye motility, red reflex, Hirschberg test and pupillary reflexes. If a child is found to have an abnormal screening result, then they are referred for diagnostic testing. If the results of the screening tests are inconclusive, or if there is insufficient cooperation, the child is also referred for diagnostic testing. All children who fail vision screening at this age are referred directly to an ophthalmologist. The criteria for referral and diagnostic testing includes asymmetric or absence of a red reflex, structural anomaly, family concern about strabismus, family history of high refractive error, strabismus or other ocular conditions (e.g. cataract).

5.4 *Vision screening - 36 months to 7 years*

Vision screening is primarily conducted by a paediatrician or GP, unless parents opt to take their child to an ophthalmologist. A visual acuity (VA) measurement is mandatory between the ages of 36-42 months. If a family opts to pay for a private consultation with an ophthalmologist, a full eye examination including eye inspection, eye motility, red reflex, Hirschberg and pupillary reflexes.

VA is conducted for the first time at age 36-months by family practitioners, nurses and midwives working with family practitioners. This is then repeated at 42-months if failed. The criteria defined for a fail is VA less than 0.5 decimal (0.3 logMAR, 6/12 Snellen) for each eye or a difference of 2 lines between both eyes. The LEA logMAR symbol test is used. In the event of one failed VA measurement, or two failed attempts if inconclusive tests or insufficient cooperation of the child, the child will be referred for diagnostic testing.

There are plans to extend vision screening of this age group to schools, which will also involve VA testing.



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

Table 1	Paediatrician	Ophthalmologist	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	Eye inspection	Eye motility	Red reflex testing	Hirschberg	Retinal examination	Pupillary reflexes	Visual acuity
Preterm babies	✓	x	✓	✓	✓	✓	x
0 to 3 months	✓	x	✓	✓	x	✓	x
3 to 36 months	✓	✓	✓	✓	x	✓	x
3 to 7 years	✓	✓	✓	✓	x	✓	✓



Table 3: Location of vision screening for each age group

Table 3	Child Health Care Centre	Hospital	Private clinic	GP office	Paediatricians office
Preterm babies	x	✓	x	✓	✓
0 to 3 months	✓	x	x	✓	✓
3 to 36 months	x	x	x	✓	✓
3 to 7 years	x	✓	x	x	x



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. No data has yet been submitted regarding automated screening practices in Turkey.



7. Provision for Visually Impaired

In Turkey, there are approximately ten schools for blind or severely visually impaired children. However, we are unable to determine the costs per child for these schools. There is support for visually impaired children who attend mainstream primary schools, such as magnifying glasses.



8. Knowledge of existing screening programme

8.1 Prevalence/Diagnosis

In Turkey, the prevalence of treated or untreated amblyopia is estimated at between 3-4%, with a prevalence of persistent amblyopia (missed by screening or failed treatment by the age of 7 years) at 0.02%. No further data is available.

8.2 Coverage

All children are invited for a vision screen, however, in 2016, attendance was 61%. The vision screening protocol is offered as part of general screening.

8.3 Screening evaluation

The number of false positive referral and false negative referrals is not known. The positive predictive value, sensitivity and specificity of vision screening in Turkey is not known.

8.4 Treatment success

It is not known if there is registration or documentation of noncompliance with referral after an abnormal screening test result.

It is estimated that about 1000 patients are treated for congenital cataracts per year by orthoptists and/or ophthalmologists. The numbers for amblyopia and strabismus are not known. Ophthalmologists are the only professionals that prescribe glasses for children under the age of 7 years. Other treatment options include patching, penalisation with glasses, atropine and cataract surgery.



9. Costs of vision screening in children

9.1 Cost of vision screening

In Turkey, vision screening professionals earn between 40,000 and 60,000 Euros per year. There is no information regarding salary costs per hour, nor is there any data pertaining to how much it costs to train the general preventative child healthcare professionals, between leaving secondary education to qualification. Vision screening at the age of 3 months and 3 years are included in child follow-up programme, which is free for the family if performed in the first level. If families prefer to go for screening to a hospital and are seen by an ophthalmologist, it will cost them between 10 and 50 euros depending on the hospital and insurance. There is no financial reward for parents when children attend vision screening and there is no penalty for not attending a vision screening appointment.

9.2 Cost of treatment for amblyopia

Hospital visits for typical patients with refractive amblyopia and strabismic amblyopia, including follow-up, are covered by general health insurance provided by the state. The cost to the state is not known.

9.3 Cost of Treatment for strabismus

The estimated costs for strabismus surgery, including follow-up, is unknown as this is also covered by general health insurance and general social security for those under the age of 18 years. This is provided by the state, therefore, it only applies to individuals being treated in state hospitals, whereas in private practice, the fee may be between 1000-2000 Euros.

9.4 Cost of treatment for cataract

Congenital cataract surgery, including follow-up of deprivation amblyopia is provided by the state, with the addition of general social security for those under the age of 18 in state hospitals. However, in private practice, this may change to between 1000-5000 Euros, including surgery and follow-up.



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