



Summary Vision Screening Data: Italy

Produced as part of Work Package 3

Paolo Mazzone¹, Dr Jill Carlton², Dr Helen Griffiths³

1. Research Assistant, School of Health and Related Research, University of Sheffield, United Kingdom (UK)
2. Senior Research Fellow, School of Health and Related Research, University of Sheffield, United Kingdom (UK)
3. Senior Lecturer, Academic Unit of Ophthalmology and Orthoptics, University of Sheffield, United Kingdom (UK)

Information provided by Andrea Lembo (University Eye Clinic San Giuseppe, Milan), Paolo Nucci (University Eye Clinic San Giuseppe, Milan) & Davide Bottin (Hospital of Bolzano)

21st December 2018

Disclaimer: This is a summary report representing the responses from a country representative working within eye care services of the country reported. This report does not represent conclusions made by the authors, and is the product of professional research conducted for the EUSCREEN study. It is not meant to represent the position or opinions of the EUSCREEN study or its Partners. The information cannot be fully verified by the authors and represent only the information supplied by the country representatives.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 733352



Contents

1	Glossary of Terms: Vision Screening	iii
2	Abbreviations	vi
3	Population and Healthcare Overview	1
4	Vision Screening Commissioning and Guidance	3
5	Screening programme	4
5.1	Vision screening - Preterm babies	4
5.2	Vision screening - Birth to 3 months	4
5.3	Vision screening - 3 months to 36 months	4
5.4	Vision screening - 36 months to 7 years	4
6	Automated Screening	8
7	Provision for Visually Impaired	9
8	Knowledge of existing screening programme	10
8.1	Prevalence/Diagnosis	10
8.2	Coverage	10
8.3	Screening evaluation	10
8.4	Treatment success	10
9	Costs of vision screening in children	11
9.1	Cost of vision screening	11
9.2	Cost of treatment for amblyopia	11
9.3	Cost of Treatment for strabismus	11
9.4	Cost of treatment for cataract	11
10	References	12



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

WHO – World Health Organisation

PPP – Purchasing Power Parity

GDP – Gross Domestic Product

NICU - Neonatal-intensive care unit



3 Population and Healthcare Overview

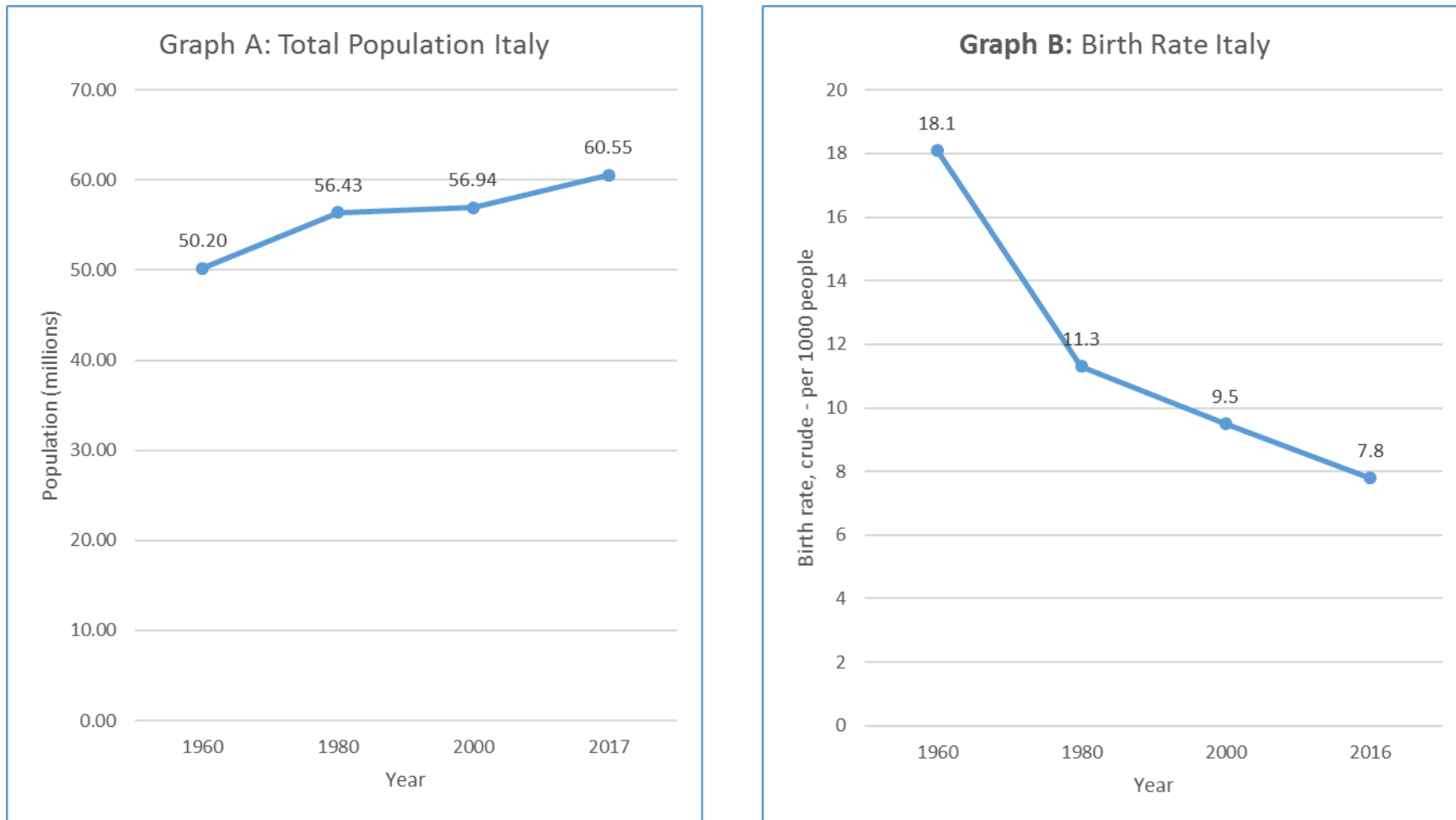
The population of Italy is 60,551,416 (World Bank, 2018a) and a birth rate estimated at 7.8 births/1,000 population in 2016 (World Bank, 2018b). The change in population and birth rate from 1960 to 2017 is shown in Figure 1, graphs A and B respectively.

Italy has a reported population density of 206 people per square kilometre in 2017 and this has risen from 172 people per square kilometre in 1961 (World Bank, 2018c). In terms of healthcare facilities, the total density of hospitals in 2013 was 2.08 per 100,000 population (WHO, 2016a). Infant mortality in 2017 is estimated at 2.9 deaths/1,000 live births in total (World Bank, 2018d).

The average life expectancy in Italy is estimated at 82.5 (World Bank, 2018e), with a death rate 10.1 deaths/1,000 population in 2016 (World Bank, 2018f). Italy has a gross national income per capita (PPP int. \$, 2013) of \$34,000 (WHO, 2016b). The estimated total expenditure on health per capita in 2014) was \$3,239 (Intl \$) and the total expenditure on health in 2014 as percentage of GDP was 9.2% (WHO, 2016b).



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



Source: Information sourced from World Bank (2018)



4 Vision Screening Commissioning and Guidance

In Italy, vision screening is organised nationally with regional variations between protocols and is embedded into a general preventative child healthcare screening system. Vision screening is funded by national health insurance, with funding allocation determined by local governments.

The content of the vision screening programme is decided upon by public health organisations and local government. It is not known when the vision screening programme was first implemented. The vision screening programme has been changed since its start date, specifically, it has been extended through to other regions of the country. Vision screening is funded based on economic availability; there are no guidelines for funding. In matters of health, there is a certain level of autonomy between the various regions. There are no vision screening guidelines in Italy. It is not known how often the vision screening programme is reviewed, who decides upon any revisions, or how often reviews are funded and take place. There are methods for quality assessment imposed by the government – however, it is not clear how this is conducted.

Vision screening is conducted by ophthalmologists, paediatricians, or orthoptists in either a hospital, school, or external clinics. There is no available data regarding the number of vision screening professionals per million population. Nurses have been identified as general professionals who do not screen, but could do so with additional training. However, there is currently no specific training to perform vision screening.

There has been no cost-effectiveness analysis of the vision screening programme, or any other studies on the effectiveness of the vision screening programme.



5 Screening programme

The target conditions of vision screening are retinopathy of prematurity, congenital eye disorders and amblyopia. Children are screened at birth, 1 month and 6 years of age. Every child is invited for vision screening; this is done by the paediatricians. 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 a paediatrician or ophthalmologist in a hospital. The vision screening tests used include red reflex testing and a retinal examination and this is conducted within the first month of life.

5.2 Vision screening - Birth to 3 months

Well, healthy babies aged up to 3 months are screened by a paediatrician, ophthalmologist, or orthoptist. The vision screening is conducted in a hospital using an eye inspection, red reflex testing and ocular motility assessment. These tests are conducted within the first month of life. The orthoptist will carry out the examination of the eye and the first part of the eye examination (Ocular motility). Only the paediatrician or ophthalmologist perform fundus red reflex examination to diagnose a white pupil. Referral criteria for further diagnostic examination are undefined, but it is known that vision screening is repeated, before referral for further diagnostic examination if there is the presence of abnormal red reflex.

5.3 Vision screening - 3 months to 36 months

Children aged 3 months to 36 months are screened by a paediatrician within the paediatrician's office. The tests conducted include eye inspection, red reflex testing, ocular motility assessment and a retinal examination. These tests are conducted between 12-18 months of life. Referral for further examination to an ophthalmologist by the paediatrician occurs after one inconclusive test and vision screening is repeated, before referral for further diagnostic examination if there is the presence of abnormal red reflex.

5.4 Vision screening - 36 months to 7 years

Children aged 36 months to 7 years are screened twice by a paediatrician, orthoptist, or ophthalmologist in a hospital or school. The tests conducted include eye inspection, red reflex testing, retinal examination, cover test, alternating cover test, stereopsis using the Lang test and visual acuity measurement. Visual acuity is measured for the first time at 3 years of age in a hospital or external clinic and this is repeated for a second time at 6 years of age in schools. Visual acuity is measured by either an ophthalmologist (Tumbling E test), paediatrician (optotype with animal figures), or orthoptist. Vision screening is repeated, before referral for further diagnostic examination if there is the presence of abnormal red reflex. It is not known how many inconclusive tests necessitate referral.



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

Table 1	Paediatrician	Ophthalmologist	Orthoptist
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	Red reflex testing	Eye motility	Retinal examination	Cover test	Alternating cover test	Visual acuity measurement	Stereopsis
Preterm babies	x	✓	x	✓	x	x	x	x
0 to 3 months	✓	✓	✓	x	x	x	x	x
3 to 36 months	✓	✓	✓	✓	x	x	x	x
3 to 7 years	✓	✓	x	✓	✓	✓	✓	✓

**Table 3:** Location of vision screening for each age group

Table 3	Hospital	Paediatrician office	School
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. No automated vision screening is conducted in Italy.



7 Provision for Visually Impaired

It is not known exactly how many schools there are for blind or severely visually impaired children. This provision is variable across different regions in Italy. The costs per child for the schools for blind or severely visually impaired children are not known. There is also no information available concerning the special support for visually impaired children who attend regular primary school.



8 Knowledge of existing screening programme

8.1 Prevalence/Diagnosis

There are no sources for precise data on the prevalence of amblyopia or strabismus in the Italian pediatric population. The prevalence of treated or untreated amblyopia is estimated at 2%, with a prevalence of persistent amblyopia of 1% by the age of 7 years. There is no information to provide estimates for the incidence of the four types of amblyopia (strabismic, refractive, combined mechanism and deprivation). The prevalence of strabismus is estimated at 2%.

8.2 Coverage

The percentage of eligible children invited or attending vision screening before the age of 7 years is unknown. Other treatment options include patching. Not all children are treated due to non-attendance to vision screening and/or non-attendance to diagnostic examination with the ophthalmologist. Ophthalmologists are the only professionals who prescribe glasses for children under the age of 7 years.

There is no documentation of non-attendance of referral assessment after an abnormal screening test result, and therefore, the percentage of compliance with a referral after an abnormal screening test results is unknown.

8.3 Screening evaluation

The percentage of false negatives and false positives from vision screening is not known. The positive predictive value of a refer results after vision screening, the sensitivity of vision screening, and the specificity of vision screening are all unknown.

It is reported that, in Italy, the variation between regions does not permit accurate collection of data. Therefore, there is no standard protocol concerning monitoring and/or reporting on the outcomes of the vision screening programmes.

8.4 Treatment success

The percentage of children treated for congenital eye disorders is not known. It is estimated that the 70% of children who are screened before the age of 7 years, and identified as having strabismus, receive treatment. It is estimated that the 70% of children who are screened before the age of 7 years, and identified as having amblyopia, receive treatment.

The percentage of patients treated for congenital cataract surgery, amblyopia and strabismus per year by either an orthoptist or ophthalmologists is estimated at 2% of the population



9 Costs of vision screening in children

9.1 *Cost of vision screening*

The salary costs, per year, for each vision screening professional is not known. The salary costs per hour for each vision screening professional has not been determined. It is not known how much it costs to train general preventative child healthcare screening professionals, from leaving secondary education to qualification. The total screening costs per year for vision screening is not available, neither are the total costs per child, per year, for vision screening nationally. Vision screening is free of charge to parents and there is no financial reward for parents when children attend their vision screening appointment. There is also no penalty for not attending and vision screening is not obligatory.

9.2 *Cost of treatment for amblyopia*

The estimated costs for treatment of typical patients, with refractive amblyopia and strabismic amblyopia are not known. The number of months of treatment and follow-up required depends on the severity of amblyopia, compliance with treatment. This period may vary from 6 months to 5 years, depending on the duration of occlusive treatment.

9.3 *Cost of Treatment for strabismus*

The estimated costs strabismus surgery, including follow-up are \$600 (528.18 Euros*) per year.

9.4 *Cost of treatment for cataract*

The estimated costs for congenital cataract surgery, including follow-up of deprivation amblyopia, are \$1500 (1,320.45 Euros*) per year.

*Currency conversion as of 29/11/2018

10 References

The World Bank (2018a). *Population, total | Data*. [online] Available at: <https://data.worldbank.org/indicator/SP.POP.TOTL?locations=IT> [Accessed 26 Nov. 2018].

The World Bank. (2018b). *Birth rate, crude (per 1,000 people) | Data*. [online] Available at: <https://data.worldbank.org/indicator/SP.DYN.CBRT.IN?locations=IT> [Accessed 26 Nov. 2018].

The World Bank. (2018c). *Population density (people per sq. km of land area) | Data*. [online] Available at: <https://data.worldbank.org/indicator/EN.POP.DNST?locations=IT> [Accessed 26 Nov. 2018].

The World Bank. (2018d). *Mortality rate, infant (per 1,000 live births) | Data*. [online] Available at: <https://data.worldbank.org/indicator/SP.DYN.IMRT.IN?locations=IT> [Accessed 26 Nov. 2018].

The World Bank. (2018e). *Life expectancy at birth, total (years) | Data*. [online] Available at: <https://data.worldbank.org/indicator/SP.DYN.LE00.IN?locations=IT> [Accessed 26 Nov. 2018].

The World Bank. (2018f). *Death rate, crude (per 1,000 people) | Data*. [online] Available at: <https://data.worldbank.org/indicator/SP.DYN.CDRT.IN?locations=IT> [Accessed 26 Nov. 2018].

World Health Organisation (WHO). 2016a. Health Infrastructure - Data by country. [ONLINE] Available at: <http://apps.who.int/gho/data/view.main.30000>. [Accessed 04 June 2018].

World Health Organisation (WHO). 2016b. Countries, Italy. [ONLINE] Available at: <http://www.who.int/countries/ita/en/>. [Accessed 04 June 2018].