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Summary Vision Screening Data: France

Produced as part of Work Package 3

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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.

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Contents

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

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 test

NICU Neonatal-intensive care unit

PM Pursuit Movements

PMI Protection Maternelle et Infantile

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

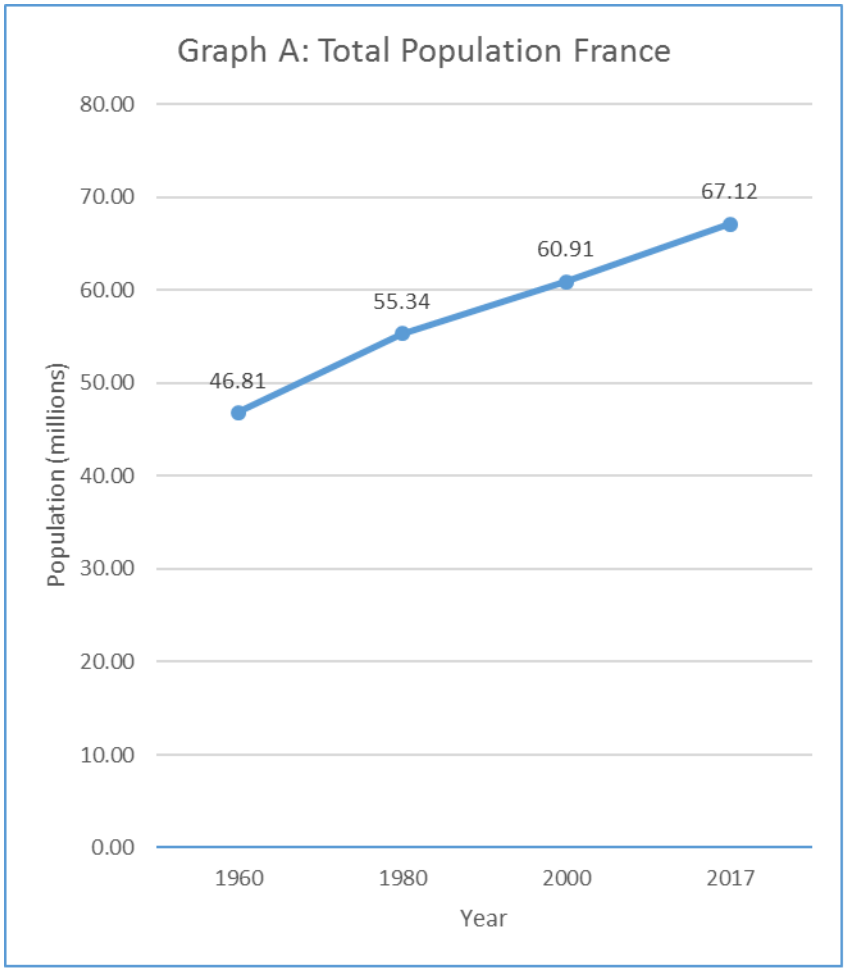
3 Population and Healthcare Overview

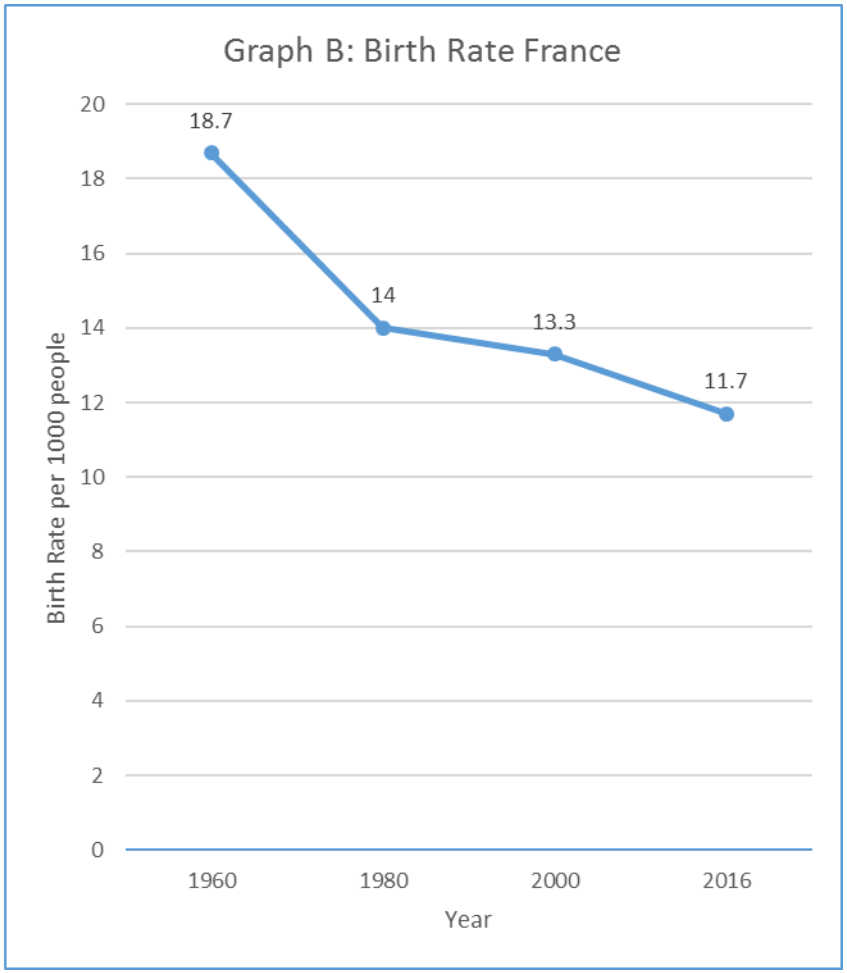
The population of France is 67,118,648 (World Bank, 2018a) and birth rate is estimated at 11.7 births/1,000 population in 2016 (World Bank, 2018b).The change in population and birth rate from 1960 to 2017 is shown in Figure 1, graphs A and B respectively.

France has a reported population density of 123 people per square kilometre in 2017 and this has risen from 87 people per square kilometre in 1961 (World Bank, 2018c). Infant mortality in 2017 is estimated at 3.5 deaths/1,000 live births in total (World Bank, 2018d).

The average life expectancy in France is estimated at 82.3 years (World Bank, 2018e), with a death rate 8.8 deaths/1,000 population in 2016 (World Bank, 2018f). France has a gross national income per capita (PPP int. $, 2013) of $37,000 (WHO, 2016). The estimated total expenditure on health per capita in 2014 was $4,508 (Intl $) and the total expenditure on health in 2014 as percentage of GDP was 11.5% (WHO, 2016).

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





Source: Information sourced from World Bank (2018)

4 Vision Screening Commissioning and Guidance

Vision screening is organised both nationally and regionally, with 4600 PMI (Protection Maternelle et Infantile (Maternal and child protection centres). The maternal and child protection centres (PMI) are public health services where parents can go during the pregnancy and until the child is 6 years of age, to receive advice and medical care. All regions provide vision screening and there are no differences in protocols between regions. The national general health screening guideline is used to inform vision screening in France.

Vision screening is funded by health insurance, the council, municipalities, the state, provinces and regions. There are no differences in funding methods between regions and all vision screening is embedded into a general preventative child health care screening programme.

The content of this vision screening programme is determined by the French Public Agency HAS and the French Health Ministry. It is not known exactly when the vision screening programme was initiated, but it has been implemented for a long time. It has been changed since its application. In 2006 the version of the health book (Carnet de Santé) provided more detail for vision screening. In April 2018, the latest version of the health book (Carnet de Santé), made some recommendations including: “Before three years, avoid putting your child in a room where the television is lit, even if he does not look at it " and "Do not give him a tablet or smartphone to calm him, during his meals, or before his sleep".

Vision screening is conducted by ophthalmologists, orthoptists, paediatricians, general physicians (GP) and nurses in hospitals, child health care centres, kindergarten, public places and schools. It is unknown how many vision screening professionals there are in France per million population. Nurses and opticians do not screen, but are general professionals that could screen with additional training. Currently, only orthoptists receive specific accredited training for vision screening. There is no other training for vision screening available.

There is no regularity regarding how often vision screening is reviewed, any revisions are decided upon by the French Public Agency HAS and the French Health Ministry. Funding for review comes from the French Public Agency HAS and free expert input. There are no methods for quality monitoring of vision screening imposed by the government, however, information is collected by the National Institute of Demographic Studies (Institut National d’Etudes Démographiques – INED). It is a French public institution specialised in demographic research and population studies. No vision screening research has been conducted in France and there has been no cost-effective analysis of the vision screening programme.

5 Screening programme

The target conditions screened for include any structural abnormality, pathology, strabismus, and reduced visual acuity. 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 up to the age of 3 months are screened by paediatricians, GPs, orthoptists or ophthalmologists in hospitals, private practice and PMI centres. This is completed using a battery of tests including eye inspection, fixation, red reflex testing, eye motility, Hirschberg test, retinal examination, pursuit movements and pupillary reflexes. It is unknown after how many abnormal or inconclusive test results a baby is referred for further examination.

5.2 Vision screening - Birth to 3 months

Well, healthy babies up to the age of 3 months are screened by paediatricians, ophthalmologists or orthoptists in hospitals, child health care centres and private clinics. This is completed by eye inspection, fixation, red reflex testing (ophthalmologist), eye motility, Hirschberg test, pursuit movements and pupillary reflexes. Tests are performed at birth and then again at 2 months. A child is referred after one abnormal result and screening is repeated at the next examination if the screening is inconclusive. The referral criteria for this age category is not defined as it is at the discretion of the examiner.

5.3 Vision screening - 3 months to 36 months

At age 3 to 36 months, vision screening is conducted by either a paediatrician, nurse, specialist, nurse, ophthalmologist, orthoptist or GP. This takes place in hospitals, PMI or private practices using eye inspection, fixation, red reflex testing, eye motility, Hirschberg test, pursuit movements, pupillary reflexes, cover test, alternating cover test, visual acuity (VA), stereopsis (Lang) and colour vision. Children are tested at 4 months, 9 months and 24 months.

A VA measurement is conducted by either a nurse, orthoptist, ophthalmologist, GP or paediatrician, for the first time at 24 months, using HOTV or Numbers. The specific charts used include Numbers, CADET Tests, or STYCAR. It is unknown after how many abnormal or inconclusive test results a child is referred for further examination. The referral criteria for this age category is not defined as this is at the discretion of the examiner, but this is usually in the event of any abnormality.

5.4 Vision screening - 36 months to 7 years

Children aged 36 months to 7 years are screened by either a paediatrician, nurse, specialist

nurse, ophthalmologist, orthoptist, or a GP. This takes places at schools, hospitals, PMI and private practices using eye inspection, fixation, red reflex testing, eye motility, Hirschberg test, pursuit movements, pupillary reflexes, cover test, alternating cover test, VA measurement, stereopsis (Lang), colour vision and automated screening (PlusOptix, Spot Vision Screener, 2Win). A VA measurement is conducted by either a nurse, orthoptist, ophthalmologist, GP or paediatrician, for the second time at 3 years of age and then a third time at 4 years of age, using HOTV, or Numbers. The specific charts used include:

- Ophthalmologists: Monoyer Test, Numbers, E letters, Pigassou test, CADET Tests
- Orthoptists: Numbers, E letters, CADET Tests or STYCAR
- GPs: CADET Tests or STYCAR

It is unknown after how many abnormal or inconclusive test results a child is referred for further examination as this is at the discretion of the examiner.

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

Table 1	Paediatrician	Nurse	Specialist nurse	Ophthalmologist	Orthoptist	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	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; SV: Stereopsis; CV: Colour Vision; AS: Automated Screening

Table 3: Location of vision screening for each age group

Table 3	Child Health Care Centre	Hospital	Private practice	PMI	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 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 France, automated screening devices are used from the age of 36 months. The referral criteria are not known. Specifically, PlusOptix, Spot Vision Screener and 2Win are devices utilised by orthoptists in schools or in private practice as part of vision screening. These devices cost approximately 6000-8000 Euros, with no maintenance costs during an initial 2-year warranty period. Institutions replace the devices every 5-10 years. The devices have similar duration of functioning.

7 Provision for Visually Impaired

In France, there are approximately 300 schools for the blind or severely visually impaired. The costs per child for these schools is unknown and whilst there is support for visually impaired children who attend mainstream primary school, it is unknown what this support is.

8 Knowledge of existing screening programme

8.1 Prevalence/Diagnosis

In France, the prevalence of treated or untreated amblyopia at age 7 is estimated at 5%, with a prevalence of persistent amblyopia at age 7 of less than 1%. The prevalence of strabismus at age 7 is estimated at 5%. The data available about the incidence of the four types of amblyopia (refractive, strabismic, combined-mechanism and deprivation) are not available.

8.2 Coverage

All children are invited for vision screening, the timelines of which are detailed in the Carnet de Santé. The use of this is reserved for health professionals and its consultation is subject to parental consent. This document contains the medical information needed to monitor the health of the child up to the age of 18 years. The method of invitation is not clear. The coverage and attendance of vision screening before the age of 7 years is unknown, as is the coverage and attendance of VA measurements as part of vision screening, before the age of 7 years. The compliance to referral after an abnormal screening result is estimated at 90%. There is no registration or documentation of noncompliance with referral after an abnormal screening result.

8.3 Screening evaluation

The percentage of false negatives and false positives for vision screening is not known. The positive predictive value of a refer result after vision screening is also not known. The sensitivity and specificity of vision screening is also not known.

8.4 Treatment success

In France, there are 1/2000 cases of congenital cataract per year – it is not clear how many are treated. Subsequent to screening, 2% of infants are treated for strabismus before the age of 7 years and this number rises to 5% for children treated for strabismus overall (including those who miss screening) before the age of 7 years. After being screened, 1% of children are treated for amblyopia and overall, 3-5% of all children (including those who miss screening) are treated for amblyopia before the age of 7 years.

In France, only ophthalmologists prescribe glasses for children aged less than 7 years, after referral from screening. In addition to this, patching, penalisation with glasses, atropine and cataract surgery are also treatment options practiced after an abnormal screening test result where appropriate. All eligible children with vision disorders are offered treatment.

9 Costs of vision screening in children

9.1 Cost of vision screening

In France, vision screening is free for parents, there is no financial reward for attending vision screening and there is no penalty for not attending. However, vision screening is mandatory. The salary costs for vision screening professionals, per year, are not known. The estimated salary cost per hour is 20 Euros. The costs of training the general preventative child health care screening professionals, between leaving secondary education and qualification are not known. The total screening costs per year for vision screening is estimated at 700 million Euros, but it is not known what the total costs per child per year are for vision screening in France.

9.2 Cost of treatment for amblyopia

The estimated costs of treating typical patients with refractive amblyopia and strabismic amblyopia are not known.

9.3 Cost of Treatment for strabismus

The estimated costs of strabismus surgery are not known.

9.4 Cost of treatment for cataract

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

10 References

The World Bank (2018a). Population, total | Data. [online] Available at: https://data.worldbank.org/indicator/SP.POP.TOTL?locations=FR [Accessed 19 December 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=FR [Accessed 19 December 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=FR [Accessed 19 December 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=FR [Accessed 19 December 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=FR [Accessed 19 December 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=FR [Accessed 19 December 2018].

World Health Organisation (WHO). (2016). Countries, France. [ONLINE] Available at: http://www.who.int/countries/fra/en/. [Accessed 19 December 2018].