Summary Vision Screening Data: Spain

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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

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

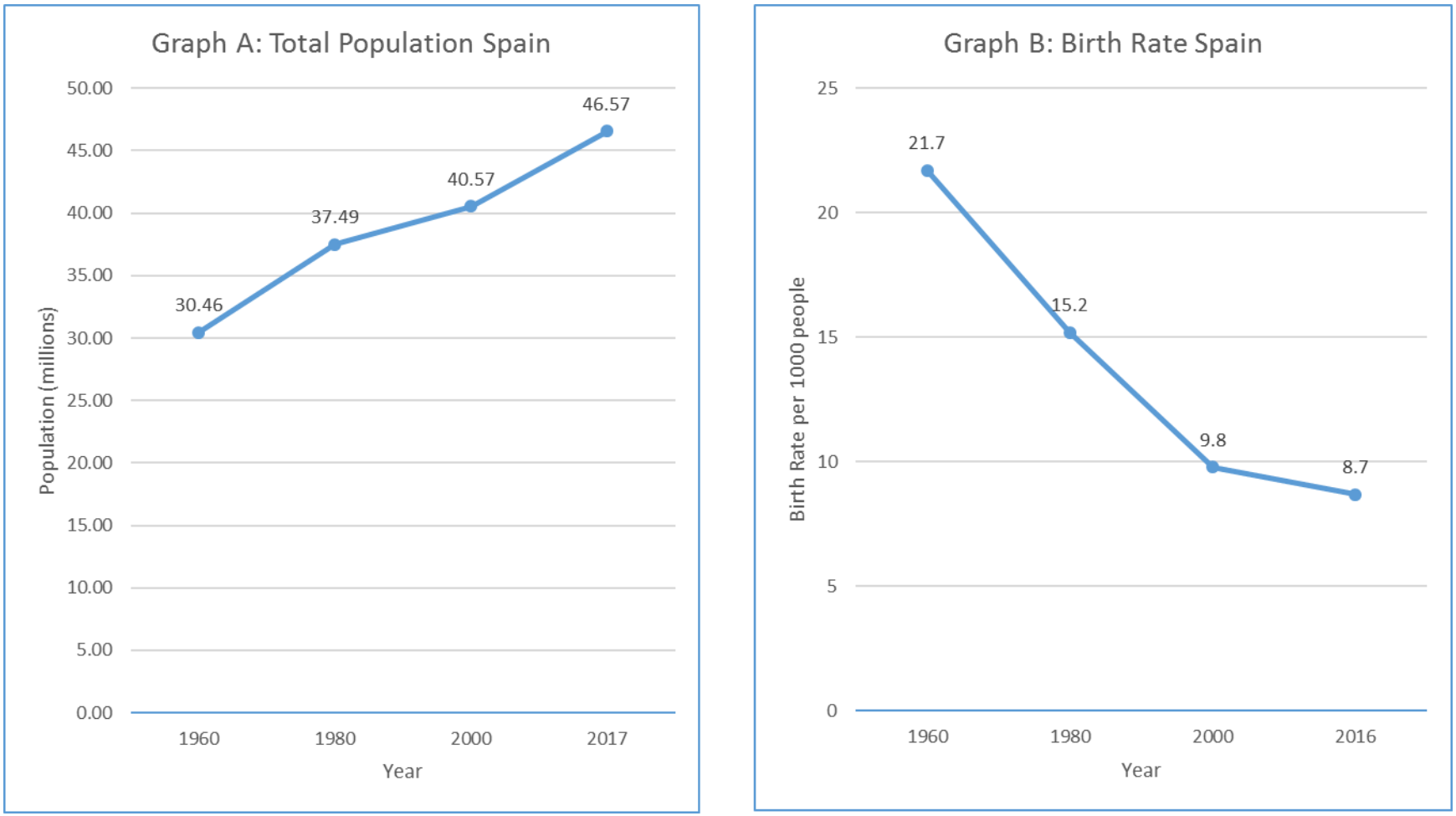
3 Population and Healthcare Overview

The population of Spain is 46,572,028 (World Bank, 2018a) and birth rate is estimated at 8.7 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.

Spain has a reported population density of 93 people per square kilometre in 2017 and this has risen from 62 people per square kilometre in 1961 (World Bank, 2018c). In terms of healthcare facilities, the total density of hospitals in 2013 was 1.63 per 100,000 population (WHO, 2016a). Infant mortality in 2017 is estimated at 2.6 deaths/1,000 live births in total (World Bank, 2018d).

The average life expectancy in Spain is estimated at 82.8 years (World Bank, 2018e), with a death rate of 8.8 deaths/1,000 population in 2016 (World Bank, 2018f). Spain has a gross national income per capita (PPP int. $, 2013) of $31,000 (WHO, 2016b). The estimated total expenditure on health per capita in 2014 was $2,966 (Intl $) and the total expenditure on health in 2014 as percentage of GDP was 9.0% (WHO, 2016b).

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



Source: Information sourced from World Bank (2018)

4 Vision Screening Commissioning and Guidance

In Spain, vision screening is organised nationally, with no regional variation. All regions perform vision screening as part of a general preventative child healthcare screening system. Despite this national programme it is known that some rural areas do not perform all the vision screening tests and there are many differences between regional funding in Spain. Pupillary reflexes and cover tests are always done, but visual acuity is not. Vision screening is funded by the state. The vision screening programme was implemented nationally in 2000, with the content being decided upon by a general screening committee in collaboration with the Strabismus Association and other organisations specific to regions, such as the Conselleria Sanitat in Valencia.

The vision screening programme has been changed since its start date, specifically in 1992 it was extended to include screening in primary care. It has not changed since 1999. There are regional general health screening guidelines for vision screening. The vision screening programme is reviewed when circumstances arise that indicate the need. The revisions are decided upon and funded by the Conselleria Salut, which is a governmental department for health that provides funds for screening. Decisions on revisions are made following meetings with experts, including paediatricians, paediatric nurses and ophthalmologist.

There are no methods for quality monitoring imposed by the government and there has been no research concerning the vision screening programme in Spain. Therefore, there is no data to determine the exact differences between vision screening in larger city regions and rural areas of Spain.

5 Screening programme

The target conditions screened for in Spain are retinopathy of prematurity (ROP), congenital eye disorders 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. 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 an ophthalmologist and a paediatrician in hospital, and then an outpatient clinic. The tests conducted at this age include eye inspection, red reflex testing, eye motility, retinal examination and pupillary reflexes. In preterm babies, the paediatrician conducts the pupillary reflexes and ophthalmologist conducts all the other tests. Referral is necessary if there is presence of white pupil or no reflex, as well as any other ocular anomaly.

5.2 Vision screening - Birth to 3 months

Well, healthy babies up to the age of 3 months are screened by a paediatrician at child healthcare centres (public health centre) or private clinics. The tests conducted at this age include eye inspection, red reflex testing, eye motility and pupillary reflexes. These tests are conducted every month up to 3 months of age. Babies are referred to an ophthalmologist after two abnormal test results, but they are not referred for any inconclusive results unless there is suspicion of pathology. Referral is necessary if there is presence of white pupil or no reflex, as well as any other ocular anomaly.

5.3 Vision screening - 3 months to 36 months

Children aged 3 to 36 months of age are screened by a paediatrician in either a public health centre or a private clinic, depending on whether parents opt for private or public screening. The tests conducted at this age include eye inspection, fixation, red reflex testing, eye motility, Hirschberg test, pupillary reflexes and cover test. Children are referred to an ophthalmologist after two abnormal test results, but they are not referred for any inconclusive results unless there is suspicion of pathology. Referral is necessary if there is presence of white pupil, no red reflex, if the child fails the Hirschberg test and if there is any other ocular anomaly including suspicion of intermittent or manifest strabismus at 6 months of age.

5.4 Vision screening - 36 months to 7 years

Children aged 36 months up to 7 years of age are screened by either a nurse, optometrist, or a paediatrician in an external office. Screening can be conducted once per year, but usually it is carried out at 4 years and 6 years of age. The tests conducted include eye inspection, fixation, red reflex testing, eye motility, pursuit movements, pupillary reflexes, cover test, alternating cover test, colour vision (sometimes, not always) and visual acuity measurement. Children are referred to an ophthalmologist after one abnormal test result. They are not

referred for any inconclusive results unless there is suspicion of pathology. Referral is necessary if there is presence of white pupil, no reflex, if there is presence of reduced vision and if there is any other ocular anomaly. Visual acuity screening takes place for the first time at 4 years of age. Visual acuity is measured again at 6 years of age, and then again between 11 and 14 years old. The optotype charts utilised include, most commonly Pigassou chart and Snellen, but Amsterdam picture chart and in some cases Lea Charts are used. The referral criteria include:

- < 0.5decimal (0.3 logMAR, 6/12 Snellen) at less than 4 years
- < 0.8 decimal (0.1 logMAR, 6/7.5 Snellen) at age 4 years or more
- < 1.0 decimal (0.0 logMAR, 6/6 Snellen) and a difference in visual acuity of less than 0.1 decimal at 7 years or above.

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

Table 1	**Paediatrician**	**Ophthalmologist**	**Nurse**	**Optometrist**
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	RE	Hir	PM	PR	CT	ACT	CV	VA
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; RE: Retinal examination; Hir: Hirschberg; PM: Pursuit movements; PR: Pupillary reflexes; CT: Cover Test; ACT: Alternating cover test; CV: Colour vision; VA: Visual acuity measurement*

Table 3: Location of vision screening for each age group

Table 3	**Hospital**	**Outpatient clinic**	**Public health centre**	**Private clinic**	**External 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 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 Spain as part of general vision screening. It is used in rare circumstances in private healthcare centres using either Retinomax, PlusOptix, or Welch Allyn. The exact number of private healthcare centres using these devices is not known. When they are used, it is conducted in collaboration with a visual acuity test. To date there are no official referral criteria. There is no official protocol outlining whether a child is referred if they pass the visual acuity, but fail the PlusOptix. There is no comparative data between places that do and do not conduct automated screening.

7 Provision for Visually Impaired

There are no schools for blind or severely visually impaired children in Spain. Instead, these children attend regular mainstream primary school and have support from the Blind Association known as ONCE. The costs per child for these schools is not known. In 2014, it was estimated that 99% of blind or visually impaired children attended regular mainstream school (europapress.es, 2018). The ONCE organisation provide personal teachers to schools that assess every blind or visual impaired child and their needs (different depending on the type of impairment). These teachers provide adapted books, visual aids and many new technological items that are specifically adapted for blind children.

8 Knowledge of existing screening programme

8.1 Prevalence/Diagnosis

No data available.

8.2 Coverage

No data available.

8.3 Screening evaluation

No data available.

8.4 Treatment success

Ophthalmologists, and sometimes optometrists, are the only professional who prescribe glasses for children under the age of 7 years. Other treatment options include patching, atropine and cataract surgery where appropriate. All eligible children are treated.

9 Costs of vision screening in children

9.1 Cost of vision screening

No data available.

9.2 Cost of treatment for amblyopia

No data available.

9.3 Cost of Treatment for strabismus

No data available.

9.4 Cost of treatment for cataract

No data available.

10 References

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