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Summary Vision Screening Data: Republic of Ireland

Produced as part of Work Package 3

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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

CHO   Community Health Organisations

GP   General Practitioner

GDP   Gross Domestic Product

HSE   Health Service Executive

NICU   Neonatal-intensive care unit

PPP   Purchasing Power Parity

ROP   Retinopathy of Prematurity

VA   Visual acuity

WHO   World Health Organisation

3   Population and Healthcare Overview

The population of the Republic of Ireland is 4,813,608 (World Bank, 2018a) and birth rate is estimated at 13.5 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.

The Republic of Ireland has a reported population density of 70 people per square kilometre in 2017 and this has risen from 41 people per square kilometre in 1961 (World Bank, 2018c). Infant mortality in 2017 is estimated at 3 deaths/1,000 live births in total (World Bank, 2018d).

The average life expectancy in the Republic of Ireland is estimated at 81.6 years (World Bank, 2018e), with a death rate of 6.4 deaths/1,000 population in 2016 (World Bank, 2018f). The Republic of Ireland has a gross national income per capita (PPP int. $, 2013) of $35,090 (WHO, 2016). The estimated total expenditure on health per capita in 2014 was $3,801 (Intl $) and the total expenditure on health in 2014 as percentage of GDP was 7.8% (WHO, 2016).

Figure 1: Change in the Total Population and Birth Rate in Republic of Ireland between 1960 and 2017
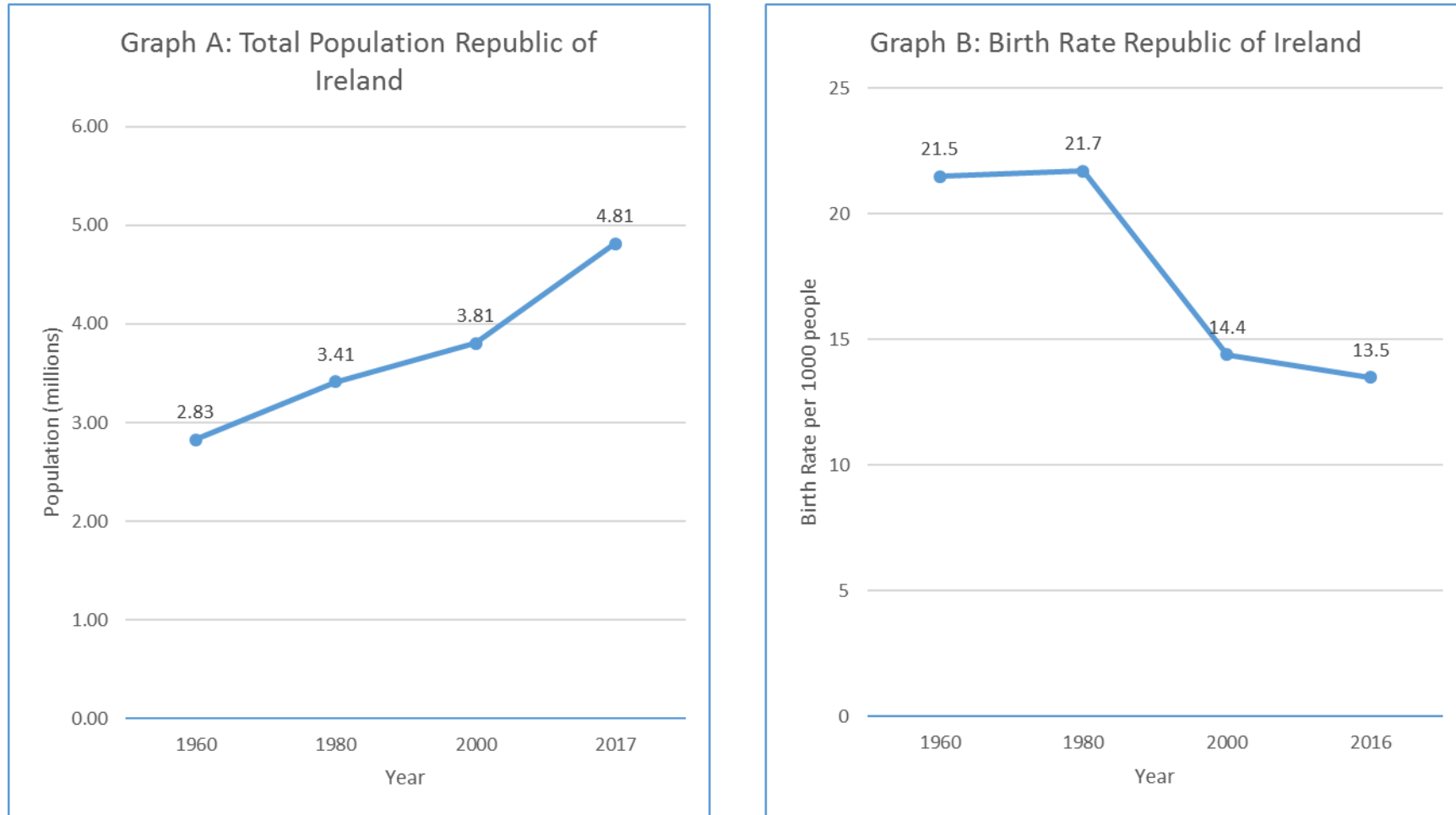
Source: Information sourced from World Bank (2018)

4 Vision Screening Commissioning and Guidance

In the Republic of Ireland, vision screening is organised regionally, specifically into nine community health organisations (CHO), all of which provide the same protocol for state – funded vision screening. Vision screening is embedded into a general preventative child healthcare screening system, the content of which is decided upon by the Health Service Executive (HSE). The vision screening programme began in the 1970's, however, it is not known when it was implemented nationally.

There are national general health screening guidelines available for vision screening, but there is no specified procedure in place for review of the programme. Any revisions would be made by the HSE and funded by the Department of Health and Children through an Eye Services Review Group; this includes ophthalmologists, orthoptists, primary care managers, public health consultant, principal medical officer, director of public health nursing and primary care finance representatives. The vision screening programme was changed, with the removal of school exit screening and colour vision testing in 2016.

There are no methods for quality monitoring imposed by the government and there has been no research concerning the effectiveness of the vision screening programme. There has been a cost-effectiveness analysis of the vision screening programme, in the form of a report by the Eye Services Review Group (Hse.ie, 2018).

In the Republic of Ireland, vision screening is conducted by ophthalmologists, paediatricians, general practitioners (GPs), area medical officers and public health nurses who have additional vision training (specialist nurse). It is not known how many of these professionals there are per million population. Registered general nurses have been identified as professionals that do not currently perform vision screening, but could do so with additional training. There is specific training provided to perform vision screening; orthoptists provide training for all vision screening public health nurses in the form of a one-day course; there is no practical element to this and no checks of competency. The training is not currently (2018) regularly updated, monitored, or revalidated and it is not accredited or certified.

5 Screening programme

The target conditions of vision screening are retinopathy of prematurity (ROP), congenital eye disorders and amblyopia. The healthcare 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 an ophthalmologist in a hospital (maternity or children's). The tests conducted at this age include eye inspection, fixation, red reflex testing, 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, GP or specialist nurse, in a hospital or child healthcare centre. The tests conducted at this age include eye inspection, fixation and red reflex testing (paediatrician). The sequence of these tests are:

- Birth - Inspection of eyes, red reflex, corneal light reflex
- Postnatal visit - Inspection of eyes, corneal light reflex
- 6 to 8 weeks - Inspection of eyes, red reflex, corneal light reflex
- 3 months - Inspection of eyes, corneal light reflex

Babies are referred for further diagnostic examination after one abnormal test result. The procedure when tests are inconclusive is not defined and will depend on clinical judgement. Referral at this age includes any abnormality or significant concern.

5.3 Vision screening - 3 months to 36 months

Infants aged 3 to 36 months are screened by either a specialist nurse or an area medical officer in a child healthcare centre. The tests conducted at this age include eye inspection and fixation. The sequence of these tests are:

- 7 to 9 months - Inspection of eyes, corneal light reflex
- 18 to 24 months - Inspection of eyes, corneal light reflex

Children are referred after one abnormal test result and between one and two inconclusive tests at the screeners' discretion. Referral at this age includes any abnormality or significant concern.

5.4 Vision screening - 36 months to 7 years

Children aged from 36 months up to 7 years of age are screened by either a specialist nurse or an area medical officer in a child healthcare centre or at school. The tests conducted at this age include eye inspection, fixation and a visual acuity (VA) measurement. The sequence of these tests are:

- 3.5 years - Inspection of eyes, corneal light reflex
- 4 to 5 years - VA test

Children are referred after one abnormal test result and between one and two inconclusive tests at the screeners discretion. Referral at 4 to 5 years includes failure to see 0.2 logMAR (0.63 decimal, 6/9.5 Snellen) on testing one or both eyes. VA is measured for the only time at school entry (4-5 years), this is not repeated as a screening test at any age. The optotype charts encouraged is Keeler crowded logMAR test but sometimes this is Sonksen crowded logMAR test or Kay picture crowded logMAR test.

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

Table 1	Ophthalmologist	Paediatrician	Specialist Nurse	GP	Area Medical Officer
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	Fixation	Retinal Examination	Pupillary Reflexes	Visual Acuity
Preterm babies	✓	✓	✓	✓	✓	✕
0 to 3 months	✓	✓	✓	✕	✕	✕
3 to 36 months	✓	✕	✓	✕	✕	✕
3 to 7 years	✓	✕	✓	✕	✕	✓

Table 3: Location of vision screening for each age group

Table 3	Hospital	Child Healthcare Centre	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. No automated screening is conducted in the Republic of Ireland.

7 Provision for Visually Impaired

There is one school in the Republic of Ireland for blind or severely visually impaired children; with 53 students enrolled. The total costs per child for these schools is unknown but free to the parents. Alternatively, special support for visually impaired children who attend mainstream primary school is provided. This consists of visiting teachers who work with the schools to tailor necessary aids for individual children if they meet the criteria of visual impairment of 6/18 (0.33 decimal, 0.45 logMAR) or less, or with a deteriorating visual condition, or with a significant visual field loss.

8 Knowledge of existing screening programme

8.1 Prevalence/Diagnosis

No data available.

8.2 Coverage

All children are invited for vision screening by the specialist nurses by letter invitation. The coverage and attendance of vision screening is not known.

8.3 Screening evaluation

The percentage of false negative and false positive referrals from vision screening is not known. The positive predictive value of a 'refer' result from vision screening, the sensitivity and the specificity of vision screening are not known.

8.4 Treatment success

Ophthalmologists and optometrists are the only professionals that prescribe glasses to children under the age of 7 years. Other treatment options include patching, penalisation with glasses and atropine. Not all children are treated due to capacity problems; specifically, some areas have no access to follow up from school screening at 4-5 years of age and it instead recommended that parents seek their own follow up with a private ophthalmologist.

9   Costs of vision screening in children

9.1   Cost of vision screening

The salary costs per year for specialist nurses is detailed by the Department of Health in the Republic of Ireland (2018) as between 47,326 and 55,980 Euros. The salary costs (range) per year for the other vision screeners listed (paediatrician, ophthalmologist, area medical officer) are not provided. The salary costs per hour for specialist nurses is estimated at between 24.59 and 29.10 Euros per hour. The salary costs per hour for the other vision screeners listed are not provided. The cost of training general preventative child health care screening professionals, from leaving secondary education to qualification is estimated at 20,000 Euros for university fees. The total screening costs per year for vision screening is not known. The total screening costs per child per year for vision screening is not known.

9.2   Cost of treatment for amblyopia

Typical patients with refractive amblyopia are referred from school screening and may require one ophthalmologist appointment (cost unknown), 6 orthoptic appointments (cost unknown) and 2 optometrist appointments (cost unknown) over the course of their treatment. A voucher towards the cost of each pair of glasses is given, either 51 Euros or 150 Euros, depending on strength of prescription. A child with strabismic amblyopia may also require additional appointments including onward referral to a surgeon (cost unknown).

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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