



Summary Vision Screening Data: Rwanda

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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 Lieke Gouma, Orthoptist, Rwanda Charity Hospital

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1. Glossary of Terms

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 be expressed either 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	<p>All infants that are considered to be at-risk or have risk factors for vision defects/ophthalmic pathology according to the screening programme.</p> <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

BCVA: Best Corrected Visual Acuity

GDP: Gross Domestic Product

NICU: Neonatal-intensive care unit

OCO: Ophthalmic Clinical Officer

PEC: Primary Eye Care

PPP: Purchasing Power Parity

RIIO: Rwanda International Institute of Ophthalmology

VA: Visual Acuity

WHO: World Health Organisation



3. Population and Healthcare Overview

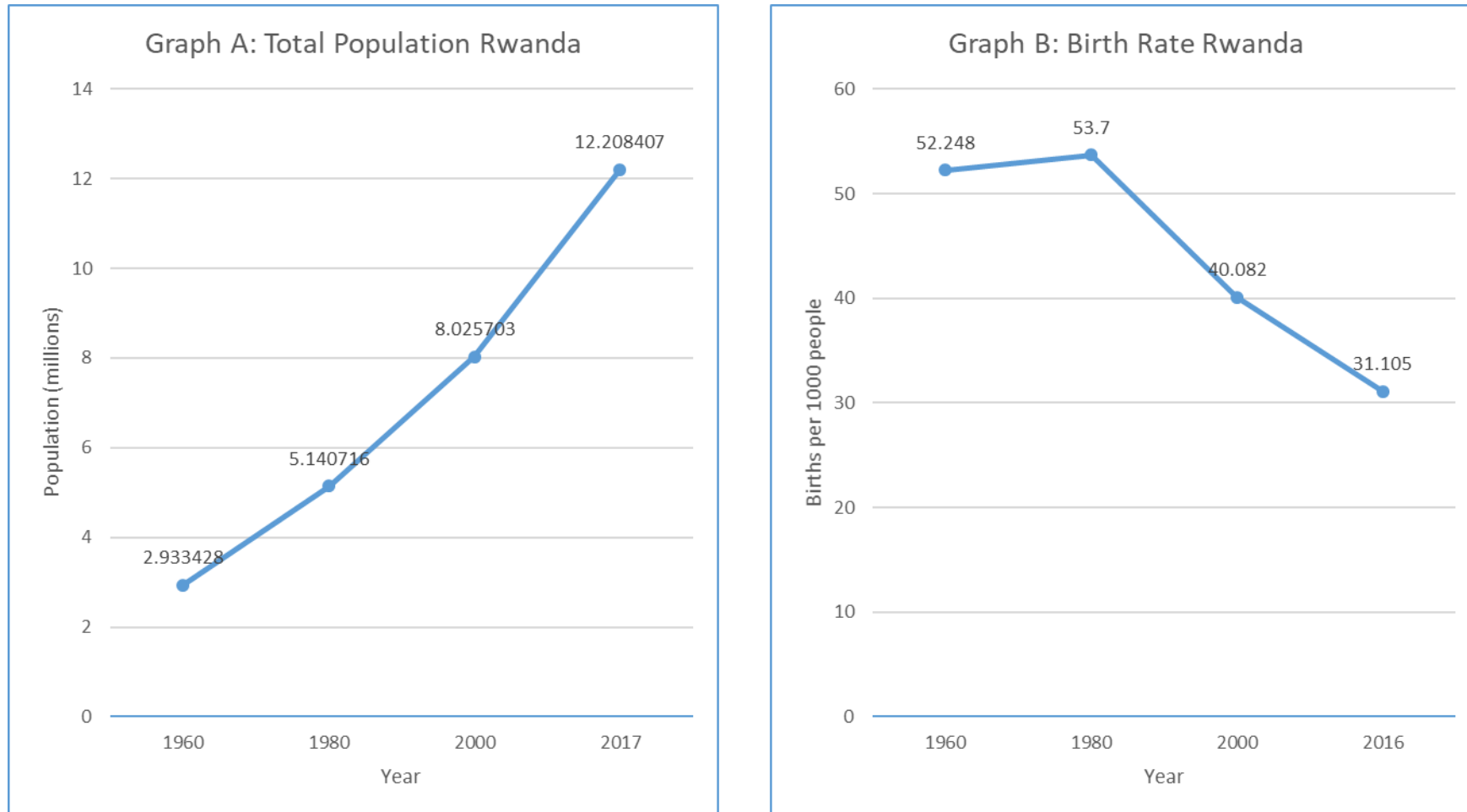
The population of Rwanda is estimated at 12,208,407 (World Bank, 2018a) and the birth rate estimated at 31.11 births/1,000 population in 2016 (World Bank, 2018b). The change in population and birth rate from 1960 to 2017 is shown in Figure 1, graphs A and B respectively.

Rwanda had a reported population density of 494.9 people per square kilometre in 2017 and this has risen from 121.5 people per square kilometre in 1961 (World Bank, 2018c). Infant mortality in 2017 was estimated at 28.9 deaths/1,000 live births in total (World Bank, 2018d).

The average life expectancy in Rwanda is estimated at 67.13 years (World Bank, 2018e), with a death rate of 5.97 deaths/1,000 population in 2016 (World Bank, 2018f). Rwanda has a gross national income per capita (PPP int. \$, 2013) of \$1,430 (WHO, 2016). The estimated total expenditure on health per capita in 2014 was \$125 (Intl \$) and the total expenditure on health in 2014 as percentage of GDP was 7.5% (WHO, 2016).



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



Source: Information sourced from World Bank (2018)



4. Vision Screening Commissioning and Guidance

In Rwanda, vision screening is organised regionally within different districts. There is no data available recording the districts that are not providing vision screening. In the districts providing vision screening the same protocols are followed as most vision screening professionals have been trained by the charity 'Vision for a Nation' using the same protocol. However, some individuals may also be conducting vision screening without training.

Community health workers, ophthalmic clinical officers (OCOs) and trained nurses conduct vision screening in health centres. There is three-day training programme to enable these personnel to perform vision screening. The training was designed and developed by Dr Ciku Mathenge in 2011 for 'Vision for a Nation'. Dr Mathenge has since worked with the World Health Organisation to adapt the course and develop it into a Primary Eye Care (PEC) curriculum for adoption by the WHO Africa region. This was launched in 2018 within the PEC Training Manual (WHO, 2018). The original course used by 'Vision for a Nation' very much forms the basis of the manual, including guidelines for screening and the protocols for referring.

In 2018 'Vision for a Nation' stopped working in Rwanda, vision screening has therefore been taken on by Rwanda International Institute of Ophthalmology (RIIO). One of the founders of this organisation is Dr Mathenge, therefore it is likely to continue using the same protocol and training (RIIO, 2019).

It is estimated by 'Vision for a Nation' (2018) that there are at least 2,797 professionals with additional training in vision screening for the entire population. There are more nurses that do not screen, but could do so with additional training.

Vision screening is funded through national mandatory health insurance, some of the population can afford private health insurance which may provide vision screening. The programme is not embedded into a general preventative child healthcare screening system.

It is not known when the vision screening programme began, or when it was nationally implemented. However, the programme has not been changed since its start date. The guidelines for vision screening are set out in a national general health screening guideline. It is not known how often the vision screening programme is reviewed; however, any revisions are decided upon and funded by Vision for a Nation. It is not known how revisions might take place and there are no methods for quality monitoring imposed by the government. There has been no research conducted concerning the vision screening programme in Rwanda or any research conducted regarding the clinical or cost-effectiveness of vision screening.



5. Screening programme

In Rwanda, the target condition(s) screened for by vision screening are not defined. 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*

No vision screening is conducted in preterm babies up to the age of 3 months.

5.2 *Vision screening - Birth to 3 months*

No vision screening is conducted in well, healthy babies up to the age of 3 months.

5.3 *Vision screening - 3 months to 36 months*

No vision screening is conducted in infants aged 3 to 36 months.

5.4 *Vision screening - 36 months to 7 years.*

Some children aged from 36 months up to 7 years of age are screened by community health workers, sometimes OCOs and nurses in health centres. Visual acuity measurement is conducted in this age group using Lea Symbols, Numbers, Landolt C, or E Chart; some crowded and some are not. Most commonly, the charts are logMAR uncrowded E-charts, but this is dependent on what is available at the health centre in question. There is no standardised age at which visual acuity is measured for the first time, or at any other age. Follow-up visual acuity checks are dependent upon whether or not the child is complaining of problems. There are no standardised criteria for referral. Children are referred after one abnormal or one inconclusive test.

School screening is currently (January 2019) being piloted, with early reports from April 2019 stating that 15 schools consisting of 19,135 students in total, screened in two months (RIIO, 2019). Of these 763 needed interventions. The age range of children tested is not specified, the test used for VA assessment was the E chart.



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.

Automated vision screening is not routinely conducted in Rwanda, however, there are 1 or 2 hospitals that have been donated a Retinomax Autorefractor. These are used within hospital eye appointments when children have symptoms, they are not used as screening tools. The maintenance costs per year are not known and there is no money to replace these items, therefore, they are used for as long as possible.



7. Provision for Visually Impaired

It is estimated that there are three schools for blind or visually impaired children with approximately 400 children attending. The costs per child for these schools is unknown. There is special support for visually impaired children that attend regular primary school, specifically, there are magnifying glasses available to prescribe via two hospitals in Rwanda. However, most children who are visually impaired do not attend school, or if the parents can afford it, they attend a special school for the visually impaired.



8. Knowledge of existing screening programme

8.1 Prevalence/Diagnosis

There is no data available regarding the prevalence of amblyopia, strabismus, or congenital cataract.

8.2 Coverage

There is no data available regarding the attendance or coverage of vision screening.

8.3 Screening evaluation

There is no data available regarding the percentage of false positive or false negative referrals from vision screening. There is no data concerning the positive predictive value, sensitivity, or specificity of vision screening.

8.4 Treatment success

There is no data concerning the percentage of eligible children treated for amblyopia, strabismus, or congenital cataract.

OCOs and ophthalmologists are the only professionals that prescribe glasses for children under the age of 7 years. Other treatment options include patching and cataract surgery. Not all are treated due to both capacity and payment problems. Some children never receive vision screening and therefore never receive a diagnosis.



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.



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