# MAIN ANALYSIS REPORT 2013/14

## SOUTH AFRICAN NATIONAL SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT

science & technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

HSRC
Human Sciences
Research Council

REPUBLIC OF SOUTH AFRICA
STATISTICIAN-GENERAL
NSS
National Statistics System

# FOREWORD

The Statistics Act (No. 6 of 1999) empowers the Statistician General to lead and coordinate statistical production and usage in South Africa. This provision enables an arrangement whereby the Department of Science and Technology (DST) has coordinated the production of National Research and Experimental Development (R&D) survey as a partner within the South African National Statistics System (SANSS) for more than a decade. The survey contributes to a body of official statistics that helps to report the country's progress in R&D as a critical aspect for development and change, both in South Africa and in the global context.

Two important developments are reflected in the 2013/14 R&D survey. Firstly, the series headline indicator of Gross Expenditure on Research and Development as a percentage of Gross Domestic Product (GERD/GDP) has been revised as a way to incorporate the benchmarking of GDP that was announced in November 2014. This has led to a downward adjustment of the GERD/GDP trend going back to 1993/94.

Secondly, the work has begun in South Africa to treat R&D as part of capital formation when compiling national Gross Domestic Product (GDP). This requires even stricter coherence of R&D data with other economic statistics. Specific adjustments in classification of certain activities, data reference periods and publication timelines are being considered in order to adhere to this requirement.

The survey is subject to an ongoing quality assessment in terms of the South African Statistical Quality Assessment Framework (SASQAF) to ensure that it remains credible and fit for purpose. The 2013/14 R&D survey achieved an overall response rate of 86.9%. This is an improvement compared to previous rounds of this survey. Important work lies ahead to further expand the universe targeted for the business sector in the survey.

Given my assessment, I endorse the 2013/14 R&D Survey results and encourage its use by stakeholders across all sectors.

*Dr Pali J Lehohla*
Statistician General, Republic of South Africa

# PREFACE

Since the adoption of a policy target for increasing research and development (R&D) expenditure- to 1.5% of GDP- within the Medium Term Strategic Framework (2014-2019), there has been an increased focus within government on ways to stimulate R&D investment across all sectors.

The annual R&D survey helps this process by providing evidence about the size, growth and composition of R&D expenditure and human capital devoted to R&D. This assists in monitoring the country's performance against set targets and also helps us understand how the R&D system is changing over time.

The 2013/14 R&D survey shows that gross expenditure on research and development (GERD) has increased in nominal terms in South Africa for the third consecutive year after the contraction in the 2009/10 and 2010/11 survey years. This is an indication that the R&D expenditure trend has stabilised. These trends reflect the general pattern of domestic economic growth and track the global trend in R&D expenditure.

While the results show an improving outlook for R&D investment in the country, the magnitude of annual real increases in GERD still appear inadequate. Increases did not keep pace with the real GDP growth over the four years 2010 to 2013; this is why R&D intensity has remained constant at 0.73%. From a policy view, R&D should expand at a faster rate than economic growth if South Africa is to significantly improve its competitiveness.

I extend my appreciation, on behalf of the Department of Science and Technology, to the Centre for Science, Technology and Innovation Indicators (CeSTII) for their efforts in conducting this survey each year, and to Statistics South Africa for facilitating the process of assessing the quality of the R&D statistics.

A special word of thanks goes to all the survey respondents, in both the private and the public sector, who gave their time so readily to make this survey a success.

Naledi Pandor

*GNM Pandor, MP*
Minister of Science and Technology

# LIST OF ABBREVIATIONS

| | |
|---|---|
| AIDS | Acquired immune deficiency syndrome |
| AU | African Union |
| BERD | Business expenditure on R&D |
| BRICS | Brazil, the Russian Federation, India, China and South Africa |
| CEO | Chief Executive Officer |
| CeSTII | Centre for Science, Technology and Innovation Indicators |
| DACST | Department of Arts, Culture, Science and Technology |
| DST | Department of Science and Technology |
| FTE | Full-time equivalent |
| GDP | Gross domestic product |
| GERD | Gross domestic expenditure on R&D |
| GOVERD | Government intramural expenditure on R&D |
| HERD | Higher education expenditure on R&D |
| HIV | Human immunodeficiency virus |
| HSRC | Human Sciences Research Council |
| ICT | Information, computer and communication technology |
| NEPAD | New Partnership for Africa's Development |
| NESTI | National Experts on Science and Technology Indicators |
| NPC | National Planning Commission |
| NPO | No-for-profit organisation |
| NSI | National System of Innovation |
| OECD | Organisation for Economic Co-operation and Development |
| PPP | Purchasing power parity |
| QMP | Quality Management Plan |
| R | Rand (South African currency) |
| R&D | Research and experimental development |
| SA | South Africa |
| SASQAF | South African Statistical Quality Assessment Framework |
| SEO | Socio-economic objective |
| SIC | Standard Industrial Classification |

| | |
|---|---|
| SOE | State-owned enterprise |
| Stats SA | Statistics South Africa |
| STI | Science, technology and innovation |
| SVC | Statistical Value Chain |
| TB | Tuberculosis |
| UIS | UNESCO Institute for Statistics |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| US/ USA | United States of America |

# DEFINITION OF TERMS

**Applied research** is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.

**Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.

**BERD** refers to business expenditure on research and experimental development.

**Biotechnology** is an application of science and technology to living organisms as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services.

**Capital expenditure** is the annual gross expenditure on fixed assets used in the R&D programmes of statistical units. Such expenditure is reported in full in the period in which it took place and is registered as an element of depreciation. Capital expenditure includes expenditure on land, buildings, instruments and equipment.

**Experimental development** is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

**Full-time equivalent (FTE)** refers to the number of hours (person-years of effort) spent on R&D activities.

**Gross domestic product (GDP)** is the total market value of all final goods and services produced in a country in a given year, equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports (Statistics South Africa).

**Gross expenditure on research and experimental development (GERD)** covers all expenditures for R&D performed on national territory in a given year. It thus includes domestically performed R&D that is financed from abroad but excludes R&D funds paid abroad, notably to international agencies.

**Headcount** refers to the actual number of people directly involved in or supporting R&D (i.e. the total number of R&D personnel).

**HERD** refers to higher education expenditure on research and experimental development.

**In-house or intramural R&D** refers to R&D performed by the unit or entity itself (i.e. by the personnel of the unit or entity). This is R&D performed within the borders of South Africa, even if funded by foreign sources.

**Labour costs** comprise annual wages and salaries and all associated costs or fringe benefits, such as bonus payments, holiday pay, contributions to pension funds and other social security payments, and payroll taxes. The labour costs of persons providing indirect services that are not included in the personnel data (such as security and maintenance personnel or the staff of central libraries, computer departments or head offices) are excluded from labour costs and included in other current expenditure.

**New materials** pertain to the technology and R&D activities of high-technology companies particularly in the aerospace, construction, electronic, biomedical, renewable energy, environmental remediation, food and packaging, manufacturing and motor car industries. New materials include multi-functional materials, advanced materials, nano-materials, nano-composites and nanotechnology.

**Other current expenditure** comprises non-capital purchases of materials, supplies and equipment to support R&D performed by the statistical unit in a given year

**Other support staff** include skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with such projects.

**Outsourced R&D** refers to R&D done by another entity on behalf of the reporting unit and paid for by the reporting unit.

**Research and experimental development (R&D)** comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

**Researchers** are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned.

**R&D intensity** refers to gross expenditure on R&D as a percentage of GDP.

**R&D personnel** include all persons employed directly on R&D activities, as well as those providing direct services such as R&D managers, administrators and clerical staff.

**R&D-performing sectors** comprise the government, higher education, business and not-for-profit sectors.

**Standard Industrial Classifications (SIC)** are codes used by Statistics South Africa for all economic activities of industries.

**Socio-economic objectives (SEO)**. The SEO classification provides an indication of the main beneficiary(ies) of R&D activities.

**Technicians and equivalent staff** are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, physical and life sciences, or social sciences and humanities.

**Total employment** is the total employment in the economy. This statistic is obtained from the Statistics South Africa Labour Force Survey series P0211, where employed persons are those aged 15–64 years who, during the reference week, did any work for at least one hour, or had a job or business but were not at work (temporarily absent).

**Year-on-year changes** are calculated as follows: Current year's figure – previous year's figure / previous year's figure × 100%.

**Public enterprises** are public corporations and quasi-corporations owned by government units. These are referred to as state-owned enterprises (SOEs) in South Africa.

# EXECUTIVE SUMMARY

Performance of research and development is aimed at creating new knowledge, products and processes. The National Survey of Research and Experimental Development (R&D survey) presents statistical indicators about the scale of investment in R&D, trends and the structure of sectors performing R&D. This information forms the basis for setting and monitoring relevant policy targets and priorities.

South Africa has undertaken R&D surveys since the 1960s. The Human Sciences Research Council's Centre for Science, Technology and Innovation Indicators (HSRC-CeSTII) has undertaken this task since 2001 under the auspices of the Department of Science and Technology. The survey generates key data on human resources and expenditure on R&D that are then used to develop indicators. This report presents the results of the 2013/14 R&D survey, which is the twelfth in the series produced by CeSTII.

## The total R&D expenditure in South Africa amounted to R25.661billion in 2013/14

This represents a nominal increase of 7.5% from the R23.871 billion recorded in 2012/13. Nominal gross domestic expenditure on R&D (GERD) increased by the same margin between 2011/12 and 2012/13. At constant 2010 Rand value, GERD amounted to R21.515 billion in 2013/14, which is a real increase of 1.4% from R21.213 billion in 2012/13.

## The upward revision of the GDP series meant GERD as a percentage of GDP was recalculated as 0.73% for 2013/14, which was the same level as for 2012/13 and 2011/12

GERD as a percentage of gross domestic product (GDP) (R&D intensity) was 0.73% in 2013/14. This calculation is based on the new GDP series published in November 2014 by Stats SA. The GDP data series was revised upwards, with the figures dating from 1993/94. As a percentage of GDP, this statistic has remained constant for the past three consecutive years.

## GERD increased for all sectors except higher education

The business sector was the largest performer of R&D in 2013/14, with expenditure amounting to 45.9% of GERD, which represented an increase of 5.2% between 2012/13 and 2013/14.

The higher education sector accounted for the second-largest expenditure on R&D at 28.4% of GERD, although this represented a decrease of 0.5% (about R40 million) from the expenditure in this sector in 2012/13. Expenditure on R&D by science councils accounted for 16.8% of GERD, followed by government at 6.6%, while the R&D expenditure recorded for not-for-profit organisations increased by 12.9%.

## The business sector increased its funding for R&D almost to the level of the government contribution

The government and business sectors were the largest funders of R&D in South Africa in 2013/14, funding 42.9% and 41.4% respectively. Higher education continued to receive the largest share of government-funded R&D at 48.8% (R5.369 billion), followed by government institutions including science councils, which received 44.1% (R4.849 billion). Government funding of R&D in the business and not-for-profit sectors was still low at 6.2% (R686 million) and 0.9% (R103 million) respectively.

## R&D personnel headcounts and FTEs continued to grow

The majority of R&D personnel were employed in higher education. Researchers accounted for the largest proportions of R&D personnel in these sectors, although the most consistent growth of R&D personnel within the higher education sector between 2009/10 and 2013/14 was in headcounts and FTEs of post-doctoral fellows, doctoral and masters students.

South Africa continues to be ahead of many countries in terms of the proportion of female researchers. The proportion of female researchers in South Africa was 44.0% of total researchers in 2013/14, continuing the gradual increase over the last eight years. This is a higher proportion than for most of the countries with high R&D expenditure performance and matches several middle-income countries.

## South Africa tracked global trends for recovering R&D spending

International comparisons suggest that South Africa followed the general global pattern for recovering R&D expenditure. South Africa is among the leading developing countries in terms of investment in R&D and innovation, but when compared to strong emerging economies in the BRICS group, the gap in GERD and R&D intensity appears to be widening. There are also dif-

ferences in expenditure levels among research-intensive countries that are not necessarily due to levels of R&D investment but result from structural differences among countries and regions.

Economies such as China, South Korea, Singapore, India and Brazil have expanded their proportions of global R&D expenditure, while South Africa's proportion of global R&D spending has remained at 0.4% for the past decade.

# ACKNOWLEDGEMENTS

The South African National Survey of Research and Experimental Development (R&D survey) is conducted annually by the HSRC-CeSTII on behalf of the DST.

CeSTII extend their appreciation to Dr Phil Mjwara (Director-General of the DST), Prof. Olive Shisana (CEO of the HSRC), Dr Temba Masilela (Deputy CEO: Research of the HSRC) and Mr Pali Lehohla (Statistician-General) for their support of the R&D survey. The support and contributions of Mr Imraan Patel, Mr Godfrey Mashamba, Ms Tshidi Mamogobo, Ms Rose Msiza and Ms Kgomotso Matlapeng of the DST are much appreciated.

Technical inputs and advice by the DST and Statistics South Africa (Stats SA) teams, as well as from the Clearance Committee for Science, Technology and Innovation Statistical Reports and from an independent external expert are appreciated.

Interactions with the Organisation for Economic Co-operation and Development's (OECD) Working Party of National Experts on Science and Technology Indicators (NESTI) continue to be invaluable in maintaining the quality and standard of the South African R&D surveys and analysis of the results. We are also most grateful for and acknowledge the co-operation of the respondents to the questionnaire.

The CeSTII team involved with the R&D survey included the following persons in no particular order: Isabel Basson, Mario Clayford, Takura Kupamupindi, Natalie le Roux, Kesewaa Koranteng, Neo Molotja, Precious Mudavanhu, Nazeem Mustapha, Saahier Parker, Natasha Saunders, Ronel Sewpaul, Moses Sithole, Natalie Vlotman, Darryn Whisgary, Farzanah Frieslar, Noor Fakier and Siphamandla Bidli.

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# INTRODUCTION

This report provides analysis and commentary on the results of the 2013/14 South African National Survey of Research and Experimental Development (R&D survey).

This Main Analysis Report is accompanied by the Statistical Report, which presents key findings and trend data. The analysis in this report is presented in terms of the following categories of indicators:

- Gross domestic expenditure on research and experimental development (GERD);
- GERD by R&D-performing sectors;
- Sources and flows of funding for R&D;
- R&D expenditure by economic sector, field of research and socio-economic objective;
- R&D personnel by occupation (researchers, technicians and support staff) and full-time equivalents (FTEs);
- R&D expenditure in multidisciplinary and selected areas of policy interest, namely biotechnology, nanotechnology, environment-related, open-source software, new materials, and tuberculosis (TB), HIV/AIDS and malaria research;
- R&D involving local and international collaborations.

The survey covered the main institutional sectors that perform R&D in South Africa, namely the business, not-for-profit, government, science council and higher education sectors. This approach is followed in order to satisfy national data needs and, at the same time, maintain consistency with the international sector categorisation for measuring R&D recommended by the Organisation for Economic Co-operation and Development (OECD) in *The Measurement of Scientific and Technological Activities: Proposed Standard Practice for Surveys on Research and Experimental Development*, commonly known as the Frascati Manual (OECD, 2002).

The description of the survey methodology is contained in Annexure I of this report.

# 1. THE CHANGING LANDSCAPE FOR R&D AND STI MEASUREMENT

Research and experimental development (R&D) and innovation continue to be central to many science, technology and innovation (STI) strategies and policies worldwide (NPC, 2013; NPCA, 2014), because R&D and innovation contribute to sustainable development and growth by providing solutions to economic and social challenges.

Indicators are key to these concepts and processes. Through the use of statistics, indicators provide information about the state of the innovation system. Indicators can assist in the allocation and tracking of STI resources, assess whether government objectives are being met, and help estimate future trends and needs. The choice of indicators and the data-collection method are crucial. Firstly, the construction and development of indicators requires a well-described framework, because that has implications for the quality and type of indicators produced. Secondly, STI indicators should not only be nationally relevant but also internationally comparable to enable benchmarking of practices, policies and relative progress.

South Africa is part of the STI measurement and indicator-development community and has made efforts to build its series of STI indicators based on internationally established best practices. The use of the Frascati Manual (OECD, 2002) has helped a great deal in this regard. In 2002, the South African government, through the Department of Science and Technology (DST), made a commitment in the National R&D Strategy (DACST, 2002) to strengthen the role of research in the economy by increasing investment in R&D and associated human resources. Specific R&D targets were set, which have been monitored through the national R&D survey indicators shown in Table 1.

The main indicators include gross expenditure on research and development (GERD) as a reflection of the level of R&D expenditure in the South African economy, and human resources in R&D with the emphasis on researchers as key knowledge producers. Other indicators of importance are business expenditure on R&D (BERD) as well as GERD and BERD financed from abroad. Funding from abroad indicates the level of interaction with the international community. Government funds R&D in two ways: direct funding from all government depart-

ments, and through the public funding of scientific and technological activities. The latter is not measured through the R&D survey.

The R&D survey is perceived to be too narrow to provide a comprehensive picture of the state of the STI system. This is partly because of changes over time which requires that measurement frameworks be adapted. The recent revision of the Frascati Manual (OECD, 2015) by the OECD is an effort to achieve this by updating the definitions, measurement and reporting methodologies of the R&D statistics. The revision recognises that the manual is a global standard and that the data produced should be accessible and relevant to users not only in the STI domain, but also in other statistical frameworks and policy areas. Among the key developments is a requirement for R&D capitalisation, in which some aspects of R&D need to be treated as investment in the compilation of GDP data and not as intermediate consumption, as was done in the past. A process has been initiated in South Africa to incorporate the new revisions into the R&D survey. Important changes arising from this will be explained in future reports.

The current survey has incorporated two important developments in the broader environment of R&D measurement. The first is the revision and rebasing of the gross domestic product (GDP) that was announced by Statistics South Africa (Stats SA) in November 2014. In the current report, real GERD values are therefore computed on the basis of 2010 Rand values. The headline indicator of GERD/GDP has also been recalculated on the basis of the new GDP series. The second is the classification of the main institutional sectors recommended in the System of National Accounts (EC, IMF, OECD, UN, and World Bank, 2009) in terms of those used in the Frascati Manual (OECD, 2002). This approach is used only indicatively in this report to assist users of data for R&D capitalisation purposes. Full implementation of this procedure will be done once the changes published in the 7th edition of the Frascati Manual (OECD, 2015) have been incorporated.

## 1.1 Key indicators

The key indicators for 2013/14 are presented in Table 1 and compared with the indicators for 2012/13 and 2011/12.

**Table 1: Key R&D indicators, South Africa, 2013/14 with comparative figures for 2012/13 and 2011/12**

| Key indicator | Value | | |
|---|---|---|---|
| | 2011/12 | 2012/13 | 2013/14 |
| Gross domestic expenditure on R&D (GERD) (Rand million) | 22 209 | 23 871 | 25 661 |
| Gross domestic product (GDP) at current prices (Rand million) | 2 917 539 | 3 138 980 | 3 534 326 |
| GERD as a percentage of GDP (%) | 0.73 | 0.73 | 0.73 |
| Civil GERD as a percentage of GDP (%) | 0.72 | 0.72 | 0.69 |
| Basic research (Rand million) | 5 440 | 6 031 | 6 102 |
| Total R&D personnel (FTE*) | 30 978.4 | 35 050.3 | 37 956.5 |
| Total researchers (FTE*) | 20 115.1 | 21 382.4 | 23 346.0 |
| Total researchers (FTE*) per 1 000 in total employment | 1.5 | 1.5 | 1.6 |
| Total R&D personnel (FTE*) per 1 000 in total employment | 2.3 | 2.4 | 2.5 |
| Total researchers (headcount) | 40 653 | 42 828 | 45 935 |
| Female researchers (headcount) as a percentage of total researchers (%) | 42.3 | 43.7 | 44.0 |

| | |
|---|---|
| Data note | * FTE = Full-time equivalent. |
| Data sources | South African National Survey of Research and Experimental Development, 2011/12 to 2013/14<br>GDP values: Stats SA, P0441 series, GDP 1st Quarter 2015<br>Total employment value: Stats SA, Labour Force Survey, P021 series |

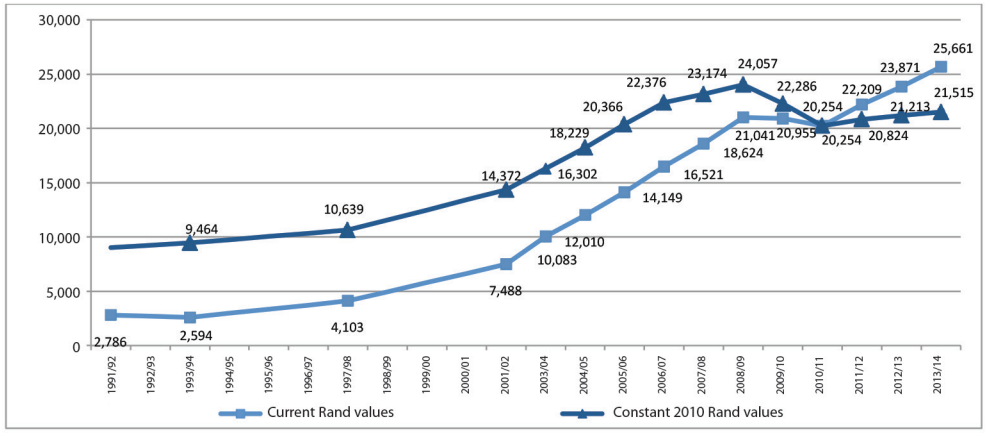
# 2. R&D EXPENDITURE

## 2.1 Gross domestic expenditure on R&D

South Africa spent R25.661 billion on research and experimental development (R&D) in 2013/14. This represents a nominal increase of 7.5% from the R23.871 billion recorded in 2012/13. At constant 2010 Rand value, gross domestic expenditure on R&D (GERD) amounted to R21.515 billion in 2013/14, which was an increase of R302 million from R21.213 billion in 2012/13.

During 2012/13, R&D expenditure increased in the higher education and not-for-profit sectors. Over this period, all but the higher education sector registered an increase in nominal R&D expenditure, with the business sector registering the largest increase.

**Figure 1: GERD in current and constant 2010 Rand value (R million), South Africa, 1991/92 to 2013/14**

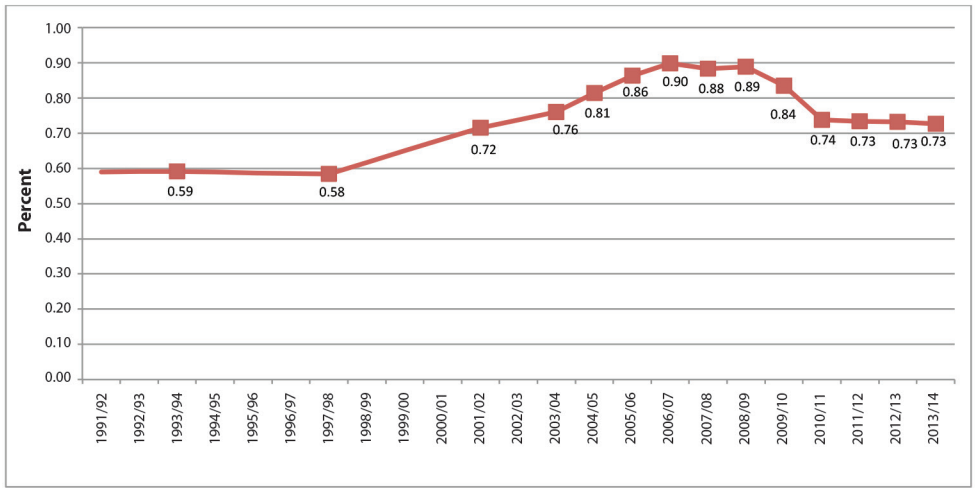



| | |
|---|---|
| Data note | GDP deflator values derived from the third quarter release of the Stats SA GDP series P0441 (Stats SA, 2014) were used to calculate constant 2010 Rand values for R&D expenditure. |
| Data sources | Revised GDP (current values): Stats SA GDP Statistical Release P0441, 3rd Quarter 2014<br>R&D expenditure: National Survey of Research and Experimental Development, 2001/02 to 2013/14. R&D expenditure for the period prior to 2001/02 was sourced from archived data (DNE, 1993; DACST, 1996; DACST, 2000) |

## 2.2 GERD as a percentage of GDP

GERD as a percentage of GDP (R&D intensity) was 0.73% in 2013/14. This indicator has remained constant for the past three consecutive years since 2011/12. Figure 2 shows that GERD as a percentage of GDP in South Africa increased steadily from 0.58% in 1997/98 and peaked at 0.90% in 2006/07. Since then, the rate of increase in R&D expenditure in nominal Rand value has continued to increase, but not at the same rate as the growth in GDP.

**Figure 2: GERD as a percentage of GDP, South Africa, 1991/92 to 2013/14**




| | |
|---|---|
| Definition | GERD expressed as a percentage of GDP indicates the intensity of R&D in an economy. |
| Data sources | Revised GDP (current values): Stats SA GDP Statistical Release P0441, 3rd Quarter 2014<br>R&D expenditure: National Survey of Research and Experimental Development, 2001/02 to 2013/14. R&D expenditure for the period prior to 2001/02 was sourced from archived data (DNE, 1993; DACST, 1996; DACST, 2000)<br>R&D intensities prior to GDP revision: National Survey of Research and Experimental Development, 2013/14 |

## 2.3 GERD by sector

The business sector was the largest performer of R&D in South Africa in 2013/14, with business expenditure on R&D (BERD) amounting to R11.783 billion, equivalent to 45.9% of GERD. This totalled R9.879 billion BERD in 2013/14 at constant 2010 Rand value, representing a 5.2% increase from the R9.394 billion recorded in 2012/13.

Higher education expenditure on R&D (HERD) decreased from R7.333 billion in 2012/13 to R7.293 billion in 2013/14, accounting for 28.4% of GERD. At constant 2010 Rand value,

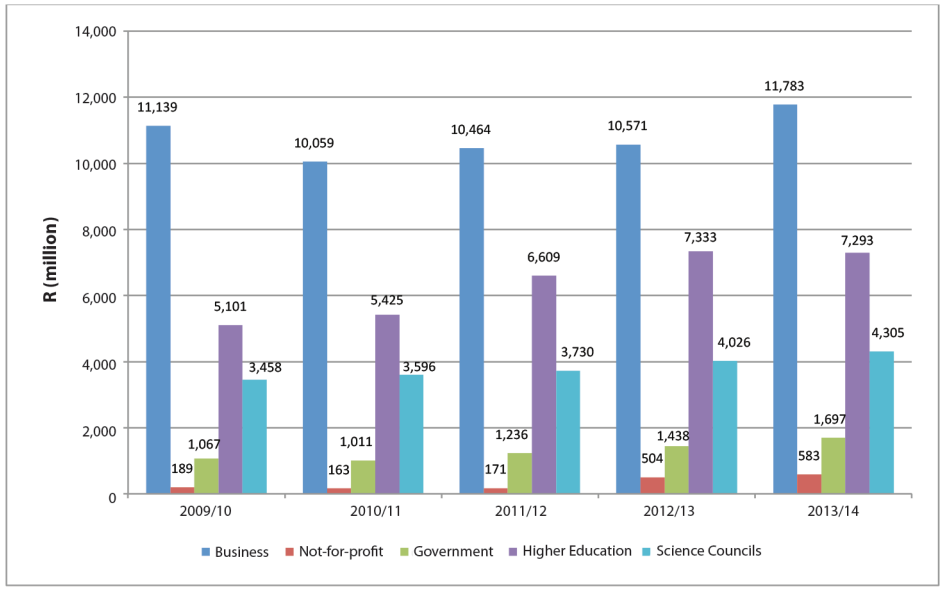
this represented a 6.2% decrease in R&D expenditure from R6.517 billion in 2012/13 to R6.115 billion in 2013/14.

Expenditure on R&D by science councils grew from R4.026 billion in 2012/13 to R4.305 billion in 2013/14 and accounted for 16.8% of total GERD. At constant 2010 Rand value, this represented a 0.9% increase from R3.578 billion in 2012/13 to R3.609 billion in 2013/14.

Government expenditure on R&D (GOVERD) constituted 6.6% of GERD and increased in current Rand value from R1.438 billion in 2012/13 to R1.697 billion in 2013/14. At constant 2010 Rand value, this represented an increase of 11.4% from R1.277 billion in 2012/13 to R1.423 billion in 2013/14.

Not-for-profit organisations recorded an increase in R&D expenditure from R504 million in 2012/13 to R583 million in 2013/14 mainly due to better coverage. At constant 2010 Rand value, this represented a 9.2% increase from R448 million in 2012/13 to R489 million in 2013/14.

## Figure 3: R&D expenditure by sector (R million), South Africa, 2009/10 to 2013/14




| | |
|---|---|
| Definition | The Frascati Manual (OECD, 2002) defines the R&D-performing sectors as the government, higher education, business and not-for-profit sectors. For these statistics, GERD has been broken down by sector of performance as recorded in the R&D survey. |
| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

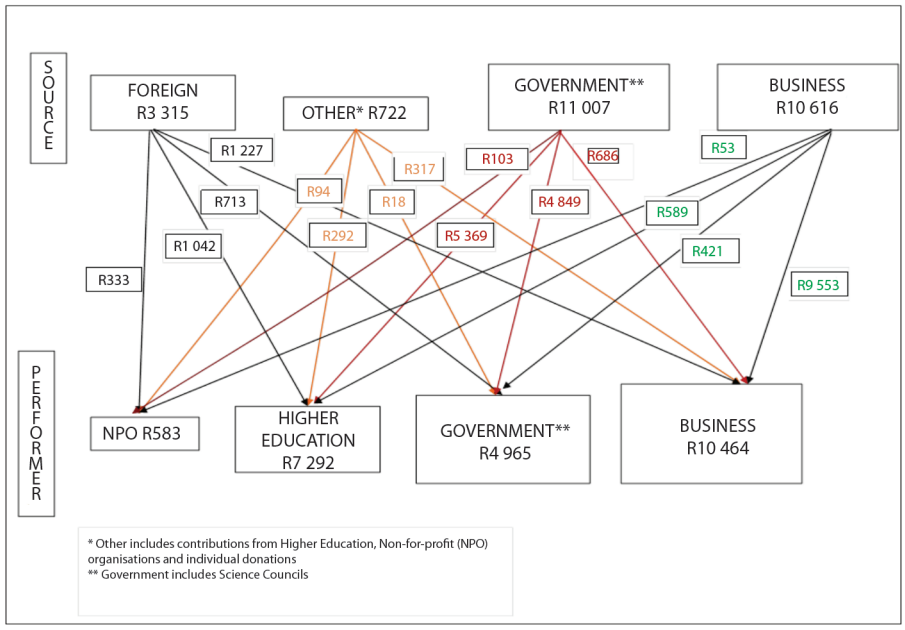
# 3. FUNDING FOR R&D

## 3.1 Major flows of R&D funding

The government and business sectors were the largest funders of R&D in South Africa in 2013/14, funding 42.9% and 41.4% respectively. Funding for R&D by government increased by 1.6% from R10.832 billion in 2012/13 to R11.007 billion in 2013/14. Business sector funding of R&D increased by 16.0% from R9.152 in 2012/13 to R10.616 in 2013/14. Funding from abroad was the third-largest source of R&D funding in 2013/14, amounting to R3.315 billion. Higher education continued to receive the largest share of government-funded R&D at 48.8% (R5.369 billion), followed by government institutions including science councils, which received 44.0% (R4.849 billion). Government funding of R&D in the business and not-for-profit sectors was still low in 2013/14 at 6.2% (R686 million) and 0.9% (R103 million) respectively.

The business sector funded 90.0% of its R&D (R9.553 billion) from its own sources. The remainder of the R&D funding by the business sector was allocated mainly to the higher education and government sectors at R589 million and R421 million respectively.

**Figure 4: Major flows of funding (R million), South Africa, 2013/14**



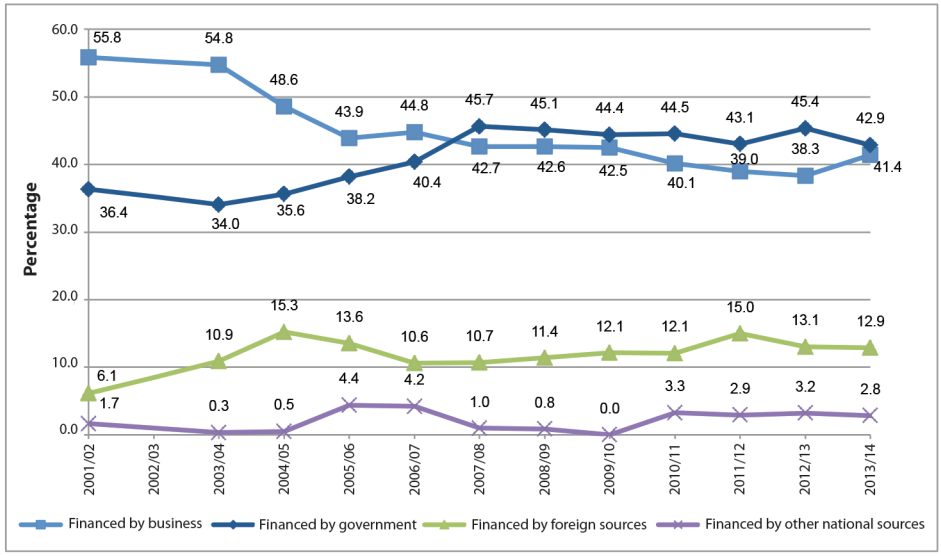

| | |
|---|---|
| Data note | *Other national sources include contributions from higher education, not-for-profit organisations and individual donations.<br>**Government includes science councils. |
| Data source | National Survey of Research and Experimental Development, 2013/14 |

## 3.2 GERD by sources of funds

Government and business enterprises have consistently funded the largest proportion of GERD in South Africa. The proportion of R&D funds from business increased in 2013/14, while the proportion of funds from government, foreign sources and other national sources decreased.

Business-funded R&D increased from 38.3% of total funding in 2012/13 to 41.4% in 2013/14, reaching its highest peak since 2009/10. The proportion of GERD financed by government decreased from 45.4% in 2012/13 to 42.9% in 2013/14, having declined steadily from 45.7% in 2007/08. Foreign funding decreased steadily from 15.0% in 2012/13 to 12.9% in 2013/14. The percentage of GERD from other national sources similarly decreased, from 3.2% in 2012/13 to 2.8% in 2013/14.

**Figure 5: GERD by source of funds (percentage), South Africa, 2001/02 to 2013/14**




| | |
|---|---|
| Data note | *Other national sources include contributions from higher education, not-for-profit organisations and individual donations.<br>**Government includes science councils. |
| Data source | National Survey of Research and Experimental Development, 2001/02 to 2013/14 |

## 3.3 Business-funded R&D

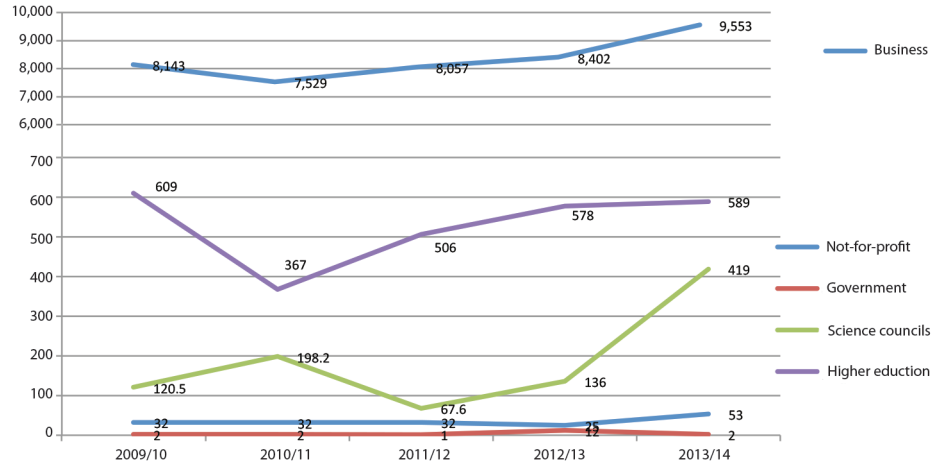
The business sector continued to fund its own research almost exclusively, funding 90.0% of its own R&D expenses in 2013/14. The funding increased steadily between 2011/12 and 2013/14.

The higher education sector was the second-largest recipient of funding from the business sector, with the investment increasing marginally from R578 million in 2012/13 to R589 million in 2013/14. Business funding of R&D in the science councils grew significantly from R136 million in 2012/13 to R419 million in 2013/14. Similarly, business funding of R&D in the not-for-profit sector increased from R25 million in 2012/13 to R53 million in 2013/14, which was the highest amount received from the business sector since 2009/10. The government sector showed the only decline in business-funded R&D, decreasing from R12 million in 2012/13 to R1.8 million in 2013/14. However, the R12 million was a record high and the previous three years were of the same order as 2013/14, ranging between R2.4 and R1.3 million.

## Table 2: Business-funded R&D by sector of performance (R '000), South Africa, 2009/10 to 2013/14

| Sector | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 |
|---|---|---|---|---|---|
| Business | 8 142 996 | 7 528 667 | 8 056 545 | 8 402 340 | 9 552 717 |
| Not-for-profit | 32 427 | 31 627 | 32 081 | 24 894 | 53 359 |
| Government | 2 326 | 2 406 | 1 355 | 11 552 | 1 759 |
| Science councils | 120 528 | 198 206 | 67 614 | 135 729 | 419 469 |
| Higher education | 609 250 | 367 340 | 505 510 | 577 527 | 588 598 |
| **Total** (current Rand value) | **8 907 527** | **8 128 246** | **8 663 105** | **9 152 042** | **10 615 902** |
| **Total** (constant 2010 Rand value) | **9 473 246** | **8 128 246** | **8 122 796** | **8 132 931** | **8 901 003** |

## Figure 6: Business-funded R&D by sector of performance (R'000), South Africa, 2009/10 to 2013/14




| | |
|---|---|
| Data note | GDP deflator values derived from the third quarter release of the Stats SA GDP series P0441 (Stats SA, 2014) were used to calculate constant 2010 Rand values for R&D expenditure. |
| Data sources | Revised GDP (current values): Stats SA GDP Statistical Release P0441, 3rd Quarter 2014<br>R&D expenditure: National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

## 3.4 Government funding of R&D

Government funding of R&D has been growing steadily and in a sustainable manner over the past few years. Higher education institutions and science councils were the largest recipients of funding from government in 2013/14, receiving R5.369 billion and R3.413 billion respectively. Government funding of R&D to the government sector (excluding science councils) increased by 13.2% from R1.269 billion in 2012/13 to R1.436 billion in 2013/14. The business sector received R&D funding of R686 million from government in 2013/14, while not-for-profit organisations received R103 million over the same period.

**Table 3: Government-funded R&D (R'000), South Africa, 2009/10 to 2013/14**

| Sector | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 |
|---|---|---|---|---|---|
| Business | 1 429 766 | 832 173 | 499 298 | 683 669 | 685 670 |
| Not-for-profit | 38 484 | 41 830 | 40 992 | 114 461 | 103 148 |
| Government | 1 008 475 | 990 290 | 1 112 307 | 1 269 337 | 1 436 141 |
| Science councils | 2 917 683 | 2 932 489 | 3 310 894 | 3 368 555 | 3 412 790 |
| Higher education | 3 918 620 | 4 222 092 | 4 598 426 | 5 395 871 | 5 369 334 |
| Total (current Rand value) | 9 313 028 | 9 018 874 | 9 561 917 | 10 831 893 | 11 007 083 |
| Total (constant 2010 Rand value) | 9 904 500 | 9 018 874 | 8 965 550 | 9 625 725 | 9 228 993 |

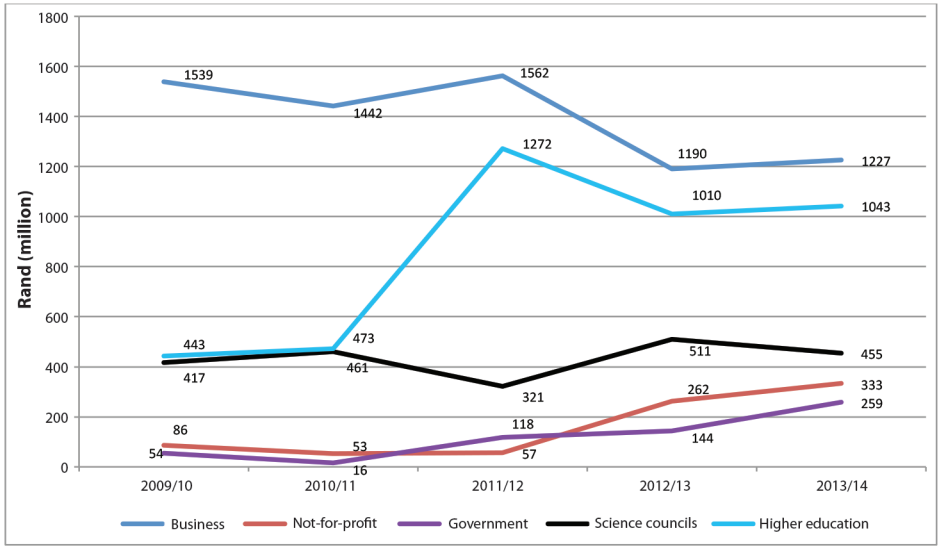
| | |
|---|---|
| Data note | GDP deflator values derived from the third quarter release of the Stats SA GDP series P0441 (Stats SA, 2014) were used to calculate constant 2010 Rand values for R&D expenditure. |
| Data sources | Revised GDP (current values): Stats SA GDP Statistical Release P0441, 3rd Quarter 2014<br>R&D expenditure: National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

## 3.5 Foreign funding of local R&D

R&D funding from abroad shows fluctuations across the sectors of R&D performance and over the years. The majority of foreign funding was received by the business (36.9%) and higher education sectors (31.4%). Foreign funding of R&D increased from R1.190 billion in 2012/13 to R1.227 billion in 2013/14 in the business sector, and increased marginally from R1.010 billion to R1.043 billion in the higher education sector over the same period. Science councils were the only sector to experience a decrease in foreign R&D funding, from R511 million in 2012/13 to R455 million in 2013/14.

Not-for-profit organisations and government, which receive the smallest percentages of foreign R&D funding, showed an increase in 2013/14. Not-for-profit organisations recorded R333 million in foreign funding (an increase of R71 million), and government recorded R259 million (an increase of R115 million).

**Figure 7: Foreign-funded R&D by sector of performance (R million), South Africa, 2009/10 to 2013/14**




| | |
|---|---|
| Data note | Foreign sources include all funding from sources abroad, from all sectors. |
| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

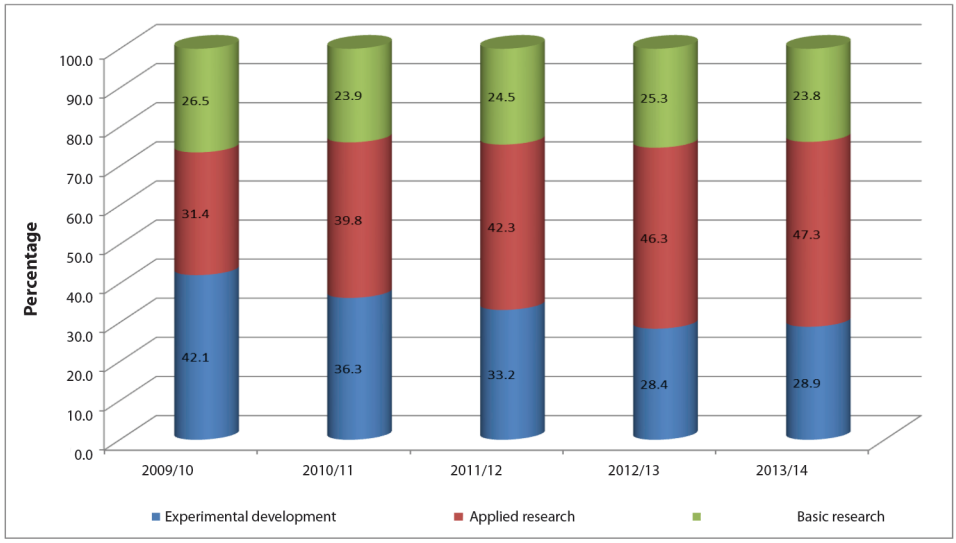
# 4. CATEGORIES OF GERD

## 4.1 GERD by type of research

The largest proportion of R&D expenditure continued to be devoted to applied research in the 2013/14 R&D survey period, accounting for 47.3% of GERD, in which is similar to 46.3% recorded in the 2012/13 reporting period. There was similarly an increase in the share of expenditure on experimental development, from 28.4% in 2012/13 to 28.9% in 2013/14, while basic research activity recorded a slight decrease from 25.3% in 2012/13 to 23.8% in 2013/14.

The increase in expenditure on applied research continued across the five-year period from 2009/10 to 2013/14, despite a lower rate of increase between 2012/13 and 2013/14. Changes in the patterns of R&D expenditure between 2009/10 and 2013/14 indicate an increase of 15.9% in applied research, while the share of expenditure on basic research declined by 2.7%, and experimental development by 13.2% over this period.

**Figure 8: GERD by type of research (percentage), South Africa, 2009/10 to 2013/14**




Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14

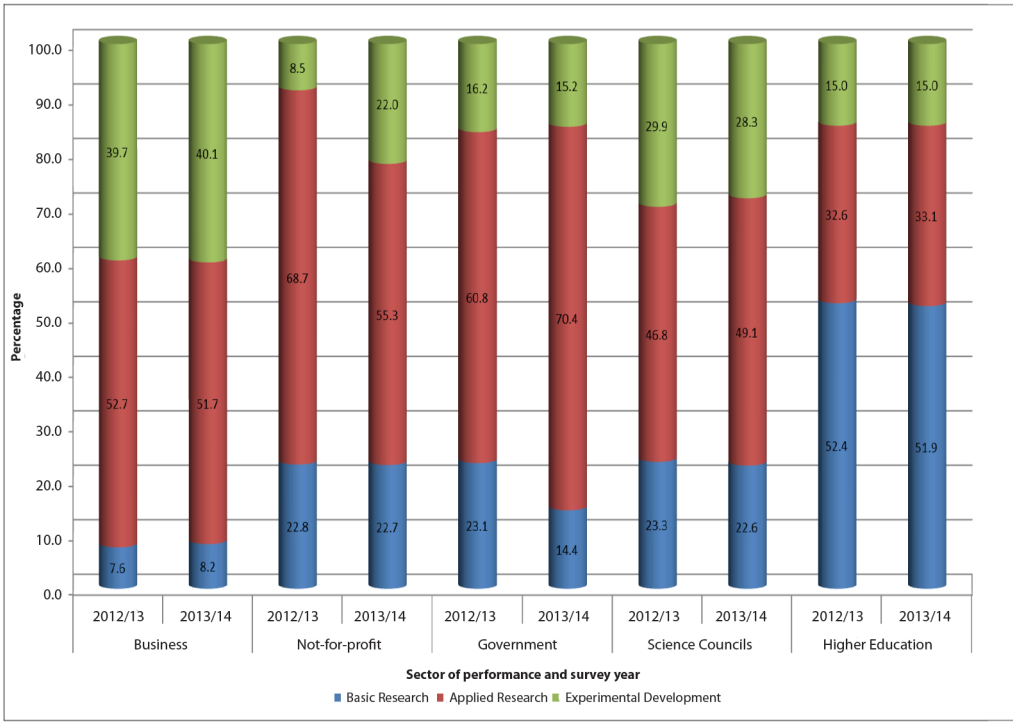
## 4.2 GERD by type of research and sector of performance

R&D activities remained relatively stable in the business sector, with minor fluctuations in the reported level of expenditure for each type of R&D. Expenditure on basic research increased by 0.6% from 7.6% in 2012/13 to 8.2% in 2013/14, while experimental development accounted for 40.1% of BERD in 2013/14 compared to 39.7% in 2012/13. Expenditure on applied research in the business sector decreased by one percentage point, from 52.7% in 2012/13 to 51.7% in 2013/14.

The not-for-profit sector recorded year-on-year changes in the type of R&D reported, with experimental development increasing from 8.5% in 2012/13 to 22.0% in 2013/14. Over this period, there was a large decrease in the percentage of expenditure reported on applied research from 68.7% to 55.3%, while the percentage of expenditure on basic research remained similar between 2012/13 at 22.8% and 22.7% in 2013/14. The changes in expenditure patterns in the not-for-profit sector are attributed to the addition of new entities reporting to the R&D survey for the first time in 2013/14. The nature of their R&D activities influenced the changing profile of R&D expenditure in the sector.

The government sector remained the largest performer of applied research, increasing its share of expenditure from 60.8% in 2012/13 to 70.4% in 2013/14. R&D expenditure by type of research in the higher education sector has remained stable year-on-year; the sector continues to be the largest performer of basic research, despite a slight decline in the value of basic research expenditure reported in the sector.

**Figure 9: GERD by type of research and sector of performance (percentage), South Africa, 2012/13 to 2013/14**




| Data source | National Survey of Research and Experimental Development,2012/13 to 2013/14 |
|---|---|

## 4.3 GERD by major research field

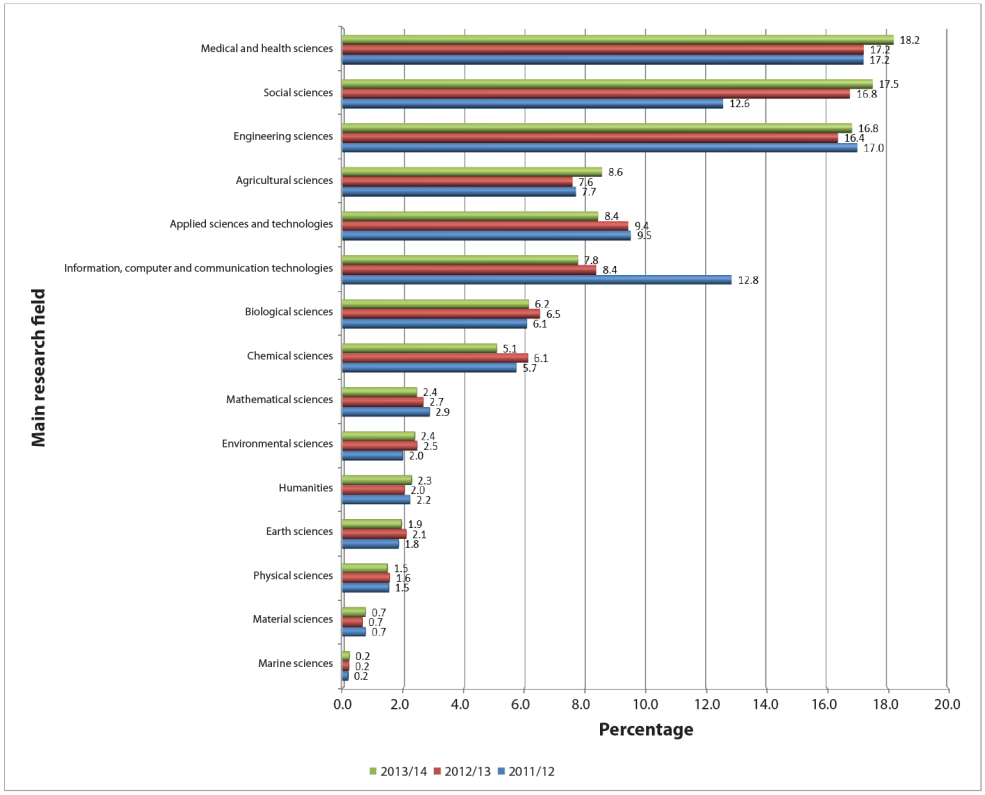
The profile of GERD by major research field remained relatively constant with respect to the relative contribution by field of science in 2013/14. The medical and health sciences accounted for the largest share of GERD, attracting 18.2% of total R&D expenditure.

As in the 2012/13 survey period, the social sciences continued to attract a growing share of GERD, with 17.5% of expenditure recorded in this research field, representing an increase of 0.7% over the period. The share of total GERD spent on the agricultural sciences increased by one percentage point over expenditure in 2012/13 to reach 8.6%, while there was a decrease of one percentage point in expenditure on applied sciences and technologies to 8.4%.

Expenditure on information, computer and communication technologies continued to decrease, from 8.4% in 2012/13 to 7.8% in 2013/14, as a result of reported R&D expenditure decreases across all sectors.

The humanities recorded an increase in the overall proportion of GERD, from 2.0% in 2012/13 to 2.3% in 2013/14.

## Figure 10: GERD by research field (percentage), South Africa, 2011/12 to 2013/14



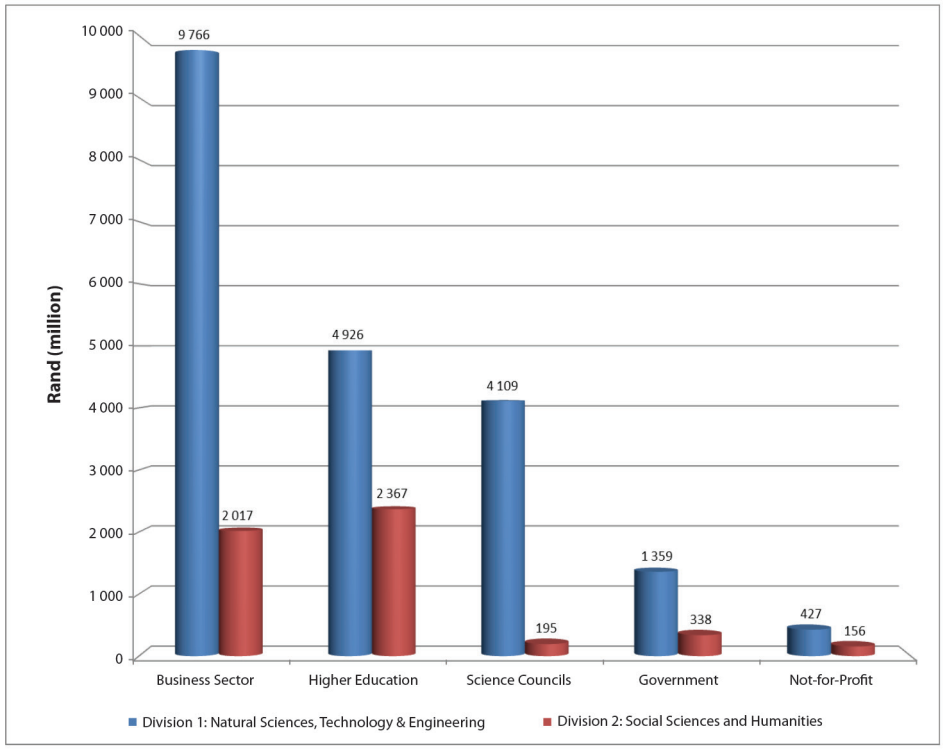

| | |
|---|---|
| Data note | GERD according to research fields as measured in the R&D survey. |
| Data source | National Survey of Research and Experimental Development, 2011/12 to 2013/14 |

## 4.4 GERD by division of research field and sector of performance

GERD by research field is divided into two divisions. Division 1 includes fields ranging from the natural sciences to technology and engineering, while Division 2 includes the social sciences and humanities. Division 1 accounted for 80.2% of GERD, while Division 2 attracted 19.8% of overall R&D expenditure.

The business sector continued as the largest performer of Division 1 research activities, spending R9.77 billion in 2013/14. The higher education sector accounted for the largest proportion of R&D expenditure on the social sciences and humanities, totalling R2.37 billion in 2013/14. R&D in the social sciences and humanities increased from R4.49 billion in 2012/13 to R5.07 billion in 2013/14, mostly through inputs from the business sector.

**Figure 11: R&D expenditure by research field (R million), South Africa, 2013/14**



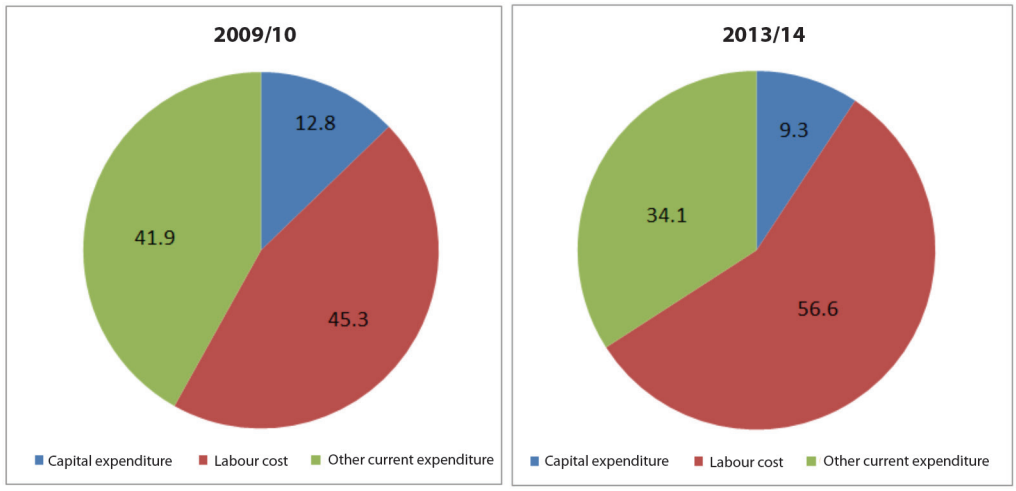

| | |
|---|---|
| Data note | Research field codes are used to classify research expenditure into two divisions according to defined scientific disciplines: Division 1 (Natural sciences, technology and engineering) and Division 2 (Social sciences and humanities). |
| Data source | National Survey of Research and Experimental Development, 2013/14 |

## 4.5 R&D expenditure by accounting category

The proportion of R&D allocated to labour costs continued to increase, from 45.3% in 2009/10 to 56.6% in 2013/14. This trend over the five-year period was driven primarily within the public sectors (higher education, science councils and government), but increases in labour costs in the business and not-for-profit sectors influenced this result to a lesser extent.

The percentage of R&D expenditure allocated to other current expenditure decreased from 41.9% in 2009/10 to 34.1% in 2013/14, while expenditure on capital items similarly decreased, from 12.8% in 2009/10 to 9.3% in 2013/14.

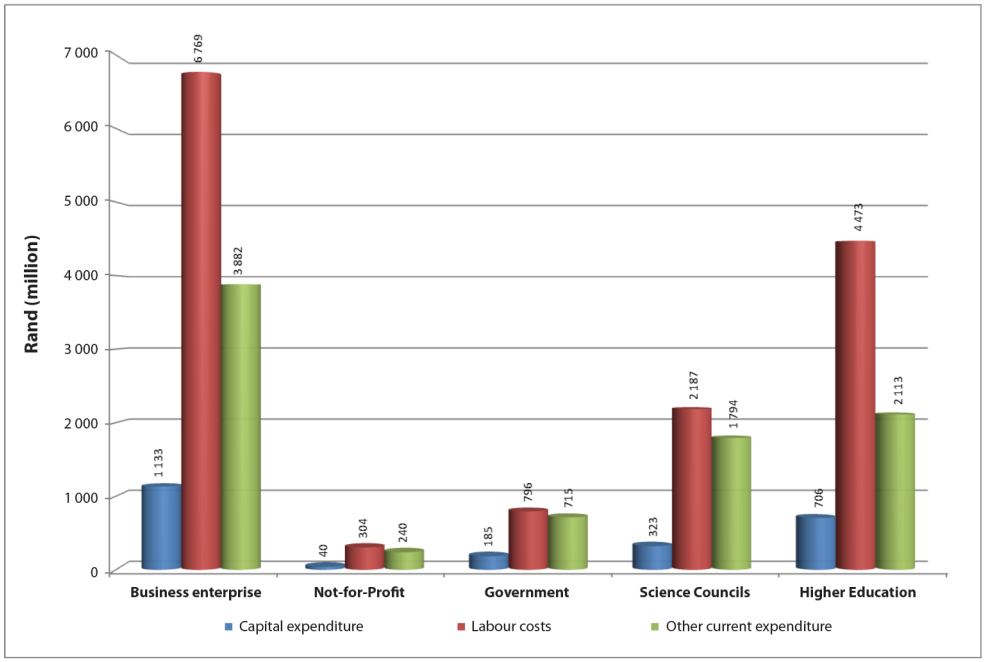
**Figure 12: R&D expenditure by accounting category (percentage), South Africa, 2009/10 and 2013/14**




| | |
|---|---|
| Definition | Other current expenditure comprises non-capital purchases of materials, supplies and equipment to support R&D performed by the statistical unit in a given year. |
| Data source | National Survey of Research and Experimental Development, 2009/10 and 2013/14 |

Labour costs continued to account for the bulk of R&D expenditure across the five sectors in 2013/14. In the business sector labour costs accounted for 57.4% of total BERD (R6.77 billion), while in the higher education sector labour costs accounted for 61.3% of sector R&D expenditure, the highest proportion across the five sectors.

**Figure 13: R&D expenditure by accounting category (R million), South Africa, 2013/14**




| Data source | National Survey of Research and Experimental Development R&D, 2013/14 |
|---|---|

## 4.6 Business sector R&D expenditure by Standard Industrial Classification

The Standard Industrial Classification (SIC) allows a detailed examination of R&D expenditure in the business sector (BERD). Since 2011/12, the financial, intermediation, real estate and business services industry was the main contributor of BERD. In 2012/13, R&D spending in the financial, intermediation, real estate and business services amounted to R3.91 billion (37.0% of total BERD). This was followed by manufacturing, which spent R3.5 billion (32.9% of BERD).

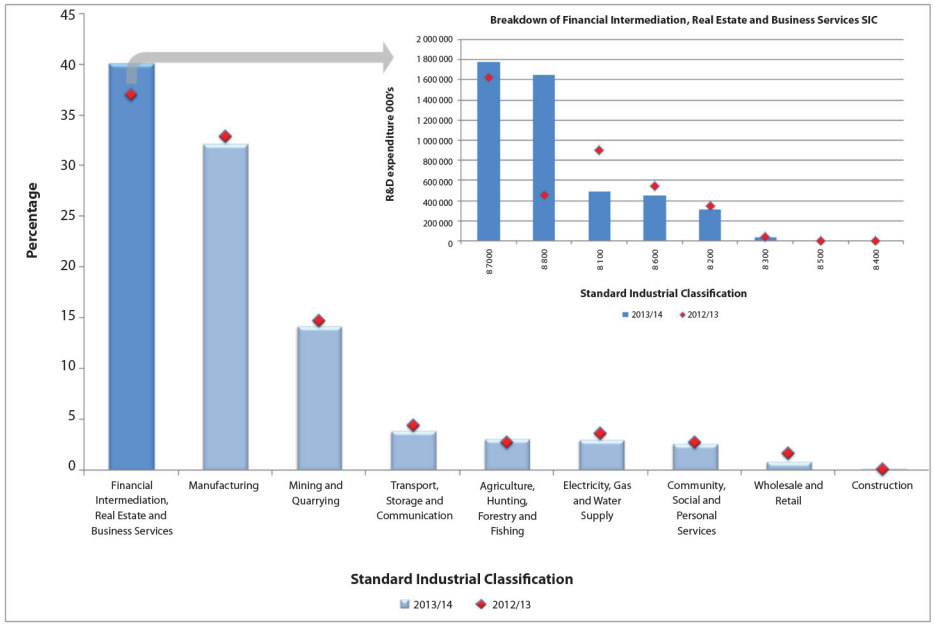
Compared to the 2012/13 survey period, the sub-sectors represented in the SIC 80000 group (financial, intermediation, real estate and business services) experienced some contraction, with financial intermediation, except insurance and pension funding (SIC 81000) accounting for only 4.5% of BERD in 2013/14 compared to 8.5% in 2012/13. By comparison, SIC code 88000 (other business activities) recorded a large increase in expenditure, from R452.34 million in 2012/13 to R1.650 billion in 2013/14, as a result of a changes in the activities of a single large R&D project as it evolved through its life-cycle.

R&D in the manufacturing sector R&D increased for the first time since 2009/10, from R3.48 billion in 2012/13 to R3.79 billion in 2013/14,. Despite this finding, the share of BERD accounted for in the manufacturing sector continued to decline across the five-year period, from 38.8% in 2009/10 to 32.2% in 2013/14. The manufacturing sector showed some growth in 2013/14, particularly in the manufacture of radio, television and communication equipment code group (SIC 37000), where R&D increased by 13.0% over the level recorded in 2012/13. The manufacture of basic metals (SIC 35000) and transport equipment (SIC 38000) also contributed to the overall growth of R&D in the manufacturing sector in 2013/14.

Mining and quarrying remained the third-largest contributor to BERD, attracting an expenditure value of R1.67 billion, a year-on-year increase of 7.8%. The agriculture, hunting, forestry and fishing sector similarly showed growth in the 2013/14 survey, with an increase in expenditure of 27.1%, from R286.83 million in 2012/13 to R364.43 million in 2013/14.

The wholesale and retail sector recorded a decrease of 44.2% in R&D expenditure in 2013/14, reporting R79.207 million less than in 2012/13. The construction sector remained a very small R&D contributor, accounting for less than 0.1% of BERD in 2013/14 and recording 11.2% less R&D expenditure in 2013/14 than in 2012/13.

**Figure 14: Business R&D expenditure by SIC category (as a percentage of GERD), South Africa, 2012/13 and 2013/14**



## Table 4: Standard Industrial Classification (SIC) categories in the 80000 group

| | |
|---|---|
| 81000 | Financial Intermediation, except Insurance and Pension Funding |
| 82000 | Insurance and Pension Funding, except Compulsory Social Security |
| 83000 | Activities Auxiliary to Financial Intermediation |
| 84000 | Real Estate Activities |
| 85000 | Renting of Machinery and Equipment, and of Personal and Household Goods |
| 86000 | Computer and Related Activities |
| 87000 | Research and Development |
| 88000 | Other Business Activities; N.E.C |

| | |
|---|---|
| Definition | Industry classification is based on Statistics South Africa's five-digit Standard Industrial Classification (SIC) codes, which are used to classify businesses according to economic activities. |
| Data source | National Survey of Research and Experimental Development, 2012/13 and 2013/14 |

## Figure 15: Business R&D expenditure by SIC manufacturing category, South Africa, 2012/13 and 2013/14

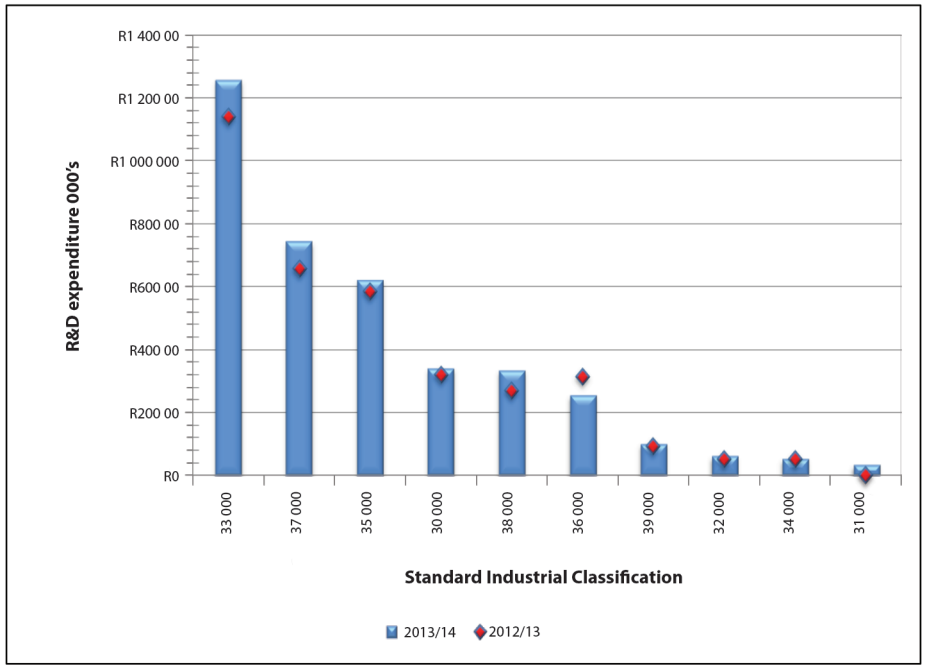


**Table 5: Standard Industrial Classification (SIC) codes in the 30000 group**

| | |
|---|---|
| 30000 | Manufacture of Food Products, Beverages and Tobacco Products |
| 31000 | Manufacture of Textiles, Clothing and Leather Goods |
| 32000 | Manufacture of Wood Products, except furniture , Paper Products, Publishing& Printing material |
| 33000 | Manufacture of Refined Petroleum ,Nuclear Fuel, Chemical Products (incl. Pharmaceuticals, Rubber and Plastic) |
| 34000 | Manufacture of Non-Metallic Mineral Products |
| 35000 | Manufacture of Basic & Fabricated Metal Products, Machinery & Equipment, Office, Accounting and Computing |
| 36000 | Manufacture of Electrical Machinery and Apparatus |
| 37000 | Manufacture of Communication Equipment &Apparatus, Medical, Precision and Optical Instruments |
| 38000 | Manufacture of Transport Equipment |
| 39000 | Manufacture of Furniture, Recycling, Manufacturing not elsewhere classified |

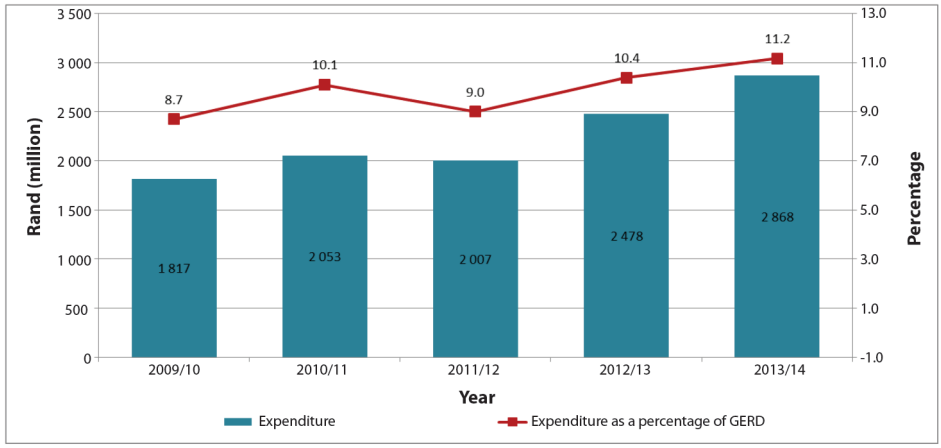
| | |
|---|---|
| Definition | Industry classification is based on Statistics South Africa's five-digit Standard Industrial Classification (SIC) codes, which are used to classify businesses according to their economic activities. |
| Data source | National Survey of Research and Experimental Development, 2012/13 and 2013/14 |

## 4.7 Areas of special interest

### 4.7.1 R&D on tuberculosis, HIV/AIDS and malaria

Areas of priority interest in health and medical activities remain a focus in relation to the National Development Plan (NPC, 2013) and related initiatives driving R&D in South Africa. R&D expenditure in priority health areas, including tuberculosis (TB), HIV/AIDS and malaria, increased by R390 million, from R2.48 billion in 2012/13 to R2.87 billion in 2013/14. R&D expenditure on TB, HIV/AIDS and malaria in 2013/14 was at its highest in the five-year period since 2009/10. Expenditure increased by 58.0% over this period, from R1.82 billion in 2009/10 to R2.87 billion in 2013/14.

**Figure 16: R&D expenditure on TB, HIV/AIDS and malaria (R million and as a percentage of GERD), South Africa, 2009/10 to 2013/14**

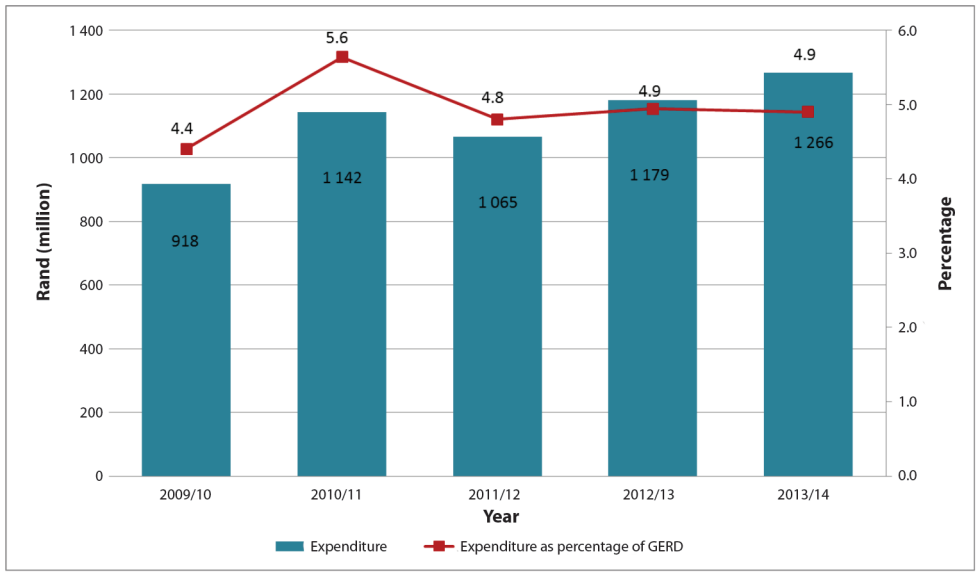



| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |
|---|---|

## 4.7.2 Biotechnology-related R&D

Expenditure on biotechnology amounted to R1.27 billion in 2013/14, representing a nominal increase of R86.85 million compared with the values reported in the 2012/13 R&D survey. This value as a percentage of GERD remained unchanged at 4.9% between 2012/13 and 2013/14.

**Figure 17: R&D expenditure on biotechnology (R million and as a percentage of GERD), South Africa, 2009/10 to 2013/14**




| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |
|---|---|

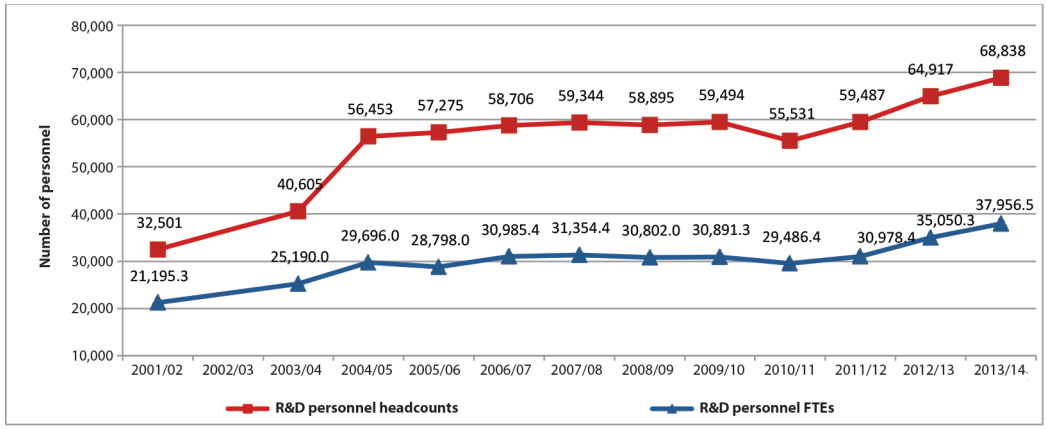
# 5. PEOPLE IN R&D

## 5.1 R&D personnel

The 2013/14 R&D survey recorded 68 838 R&D personnel (headcount), which was an increase of 3 921 since 2012/13.

There were significant increases in R&D personnel headcounts and FTEs between 2001/02 and 2004/05; marginal annual increases in headcounts and FTEs between 2005/06 and 2010/11 (with the exception of 2008/09); and more robust growth between 2010/11 and 2013/14.

**Figure 18: R&D personnel (headcount and FTEs), South Africa, 2001/02 to 2013/14**

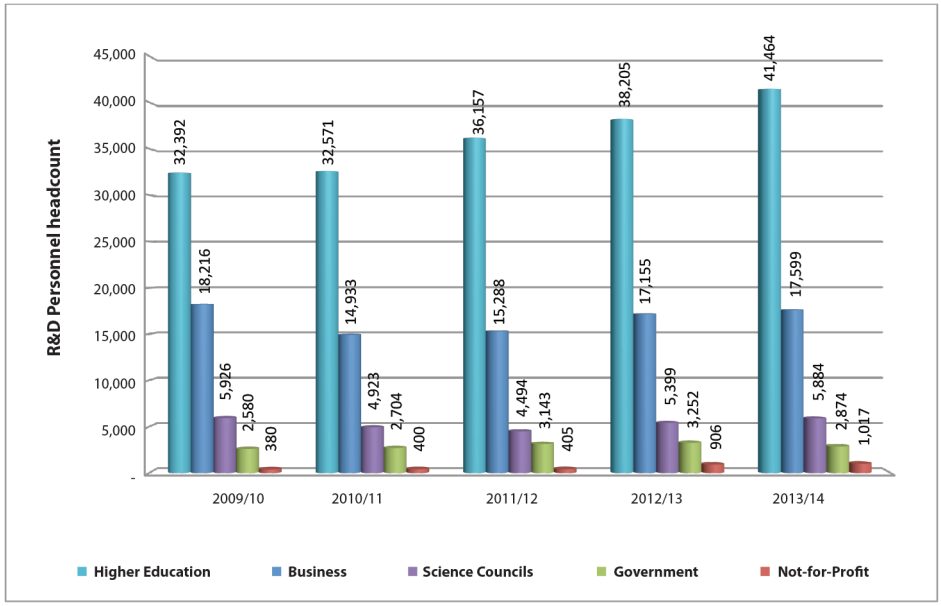



| | |
|---|---|
| Data note | Following OECD practice, doctoral students and post-doctoral fellows are counted as researchers. |
| Data source | National Survey of Research and Experimental Development, 2001/02 to 2013/14 |

## 5.1.1 R&D personnel headcount by sector of performance

In the 2013/14 R&D survey, increases in R&D personnel were recorded across all sectors except the government sector. The majority of R&D personnel were employed in the higher education and business sectors, which recorded headcounts of 41 464 and 17 599 respectively. The science councils, government and not-for-profit sectors had fewer R&D personnel. The recorded headcount of R&D personnel in the not-for-profit sector increased from 405 in 2011/12 to 1 017 in 2013/14 owing to R&D entities with large numbers of R&D personnel participating in the survey for the first time. The government sector showed a decrease in headcounts due to a reported reduction in headcounts in particular government entities as well as the influence of non-response by previously known R&D performers within the sector.

**Figure 19: R&D personnel by sector (headcount), South Africa, 2009/10 to 2013/14**

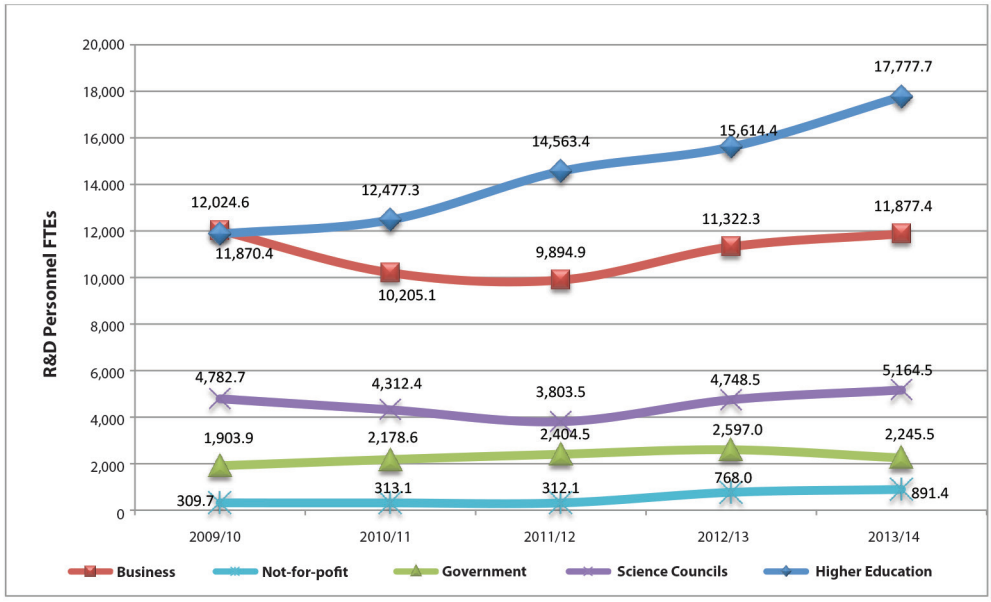



| | |
|---|---|
| Data note | Higher education R&D personnel include post-doctoral fellows and doctoral students under the 'researcher' category. The Frascati Manual recommends that masters students should not be counted as researchers. However, data on masters students are considered important and reported on in selected sections due to the potential of these students to pursue a doctoral degree. |
| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

## 5.1.2 R&D personnel full-time equivalents (FTEs) by sector of performance

In the 2013/14 R&D survey, all sectors except government reported increases in FTE R&D personnel. The highest numbers of FTEs were in higher education (17 777.7) and the business sector (11 877.4). An increase of 8.3% was recorded between 2012/13 and 2013/14. The R&D personnel FTEs per thousand in total employment indicator increased by 0.1 in each of the last three surveys, from 2.3 in 2011/12, to 2.4 in 2012/13 and 2.5 in 2013/14. The increase in R&D personnel FTEs was attributed to an increase in the number of researchers, mainly at the level of postgraduate students.

**Figure 20: R&D personnel by occupation (FTEs), South Africa, 2009/10 to 2013/14**

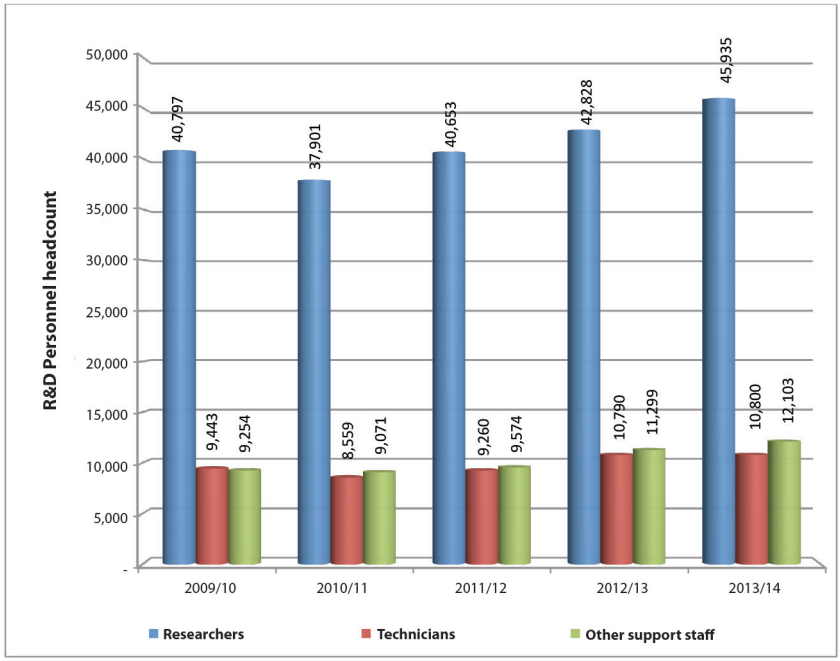



| | |
|---|---|
| Data note | Following OECD practice, doctoral students and post-doctoral fellows are counted as researchers. |
| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

## 5.1.3 R&D personnel by occupation

Researchers made up the highest number of R&D personnel, accounting for 66.7% of the total, followed by other support staff directly supporting R&D at 17.6%, and technicians at 15.7%. The headcount of researchers increased by 7.3% from 42 828 in 2012/13 to 45 935 in 2013/14. The headcount of technicians increased only slightly from 10 790 in 2012/13 to 10 800 in 2013/14, while the headcount of other support staff directly supporting R&D also increased slightly from 11 299 to 12 103 over the same period.

**Figure 21: R&D personnel by occupation (headcount), South Africa, 2009/10 to 2013/14**



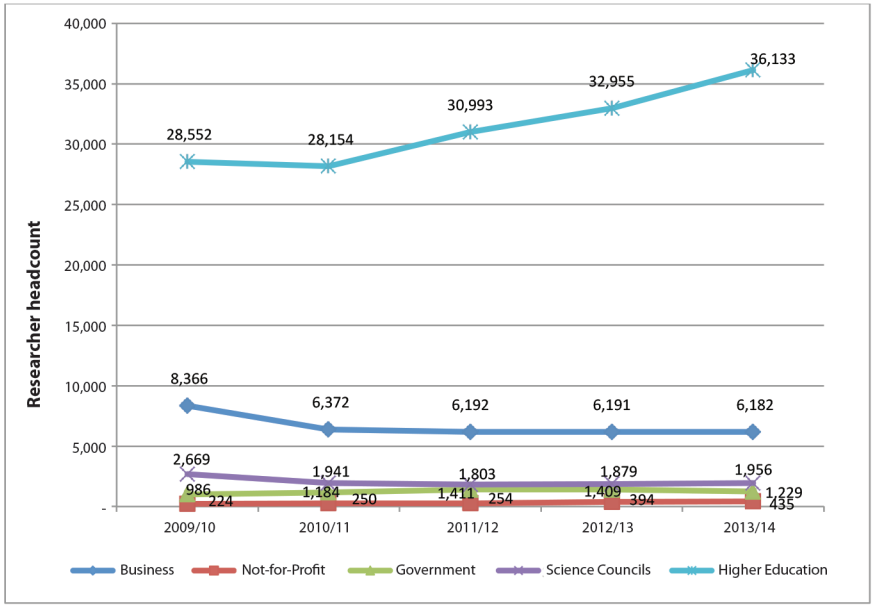

| | |
|---|---|
| Data note | Higher education R&D personnel include post-doctoral fellows and doctoral students under the 'researcher' category. |
| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

## 5.2 Researchers

### 5.2.1 Researcher headcount by sector of performance

The higher education sector had the largest number of researchers, with a headcount of 36 133 in 2013/14, having increased by 9.6% between 2012/13 and 2013/14. Researcher headcounts increased by 10.4% in the not-for-profit sector between 2012/13 and 2013/14, and by 4.1% in the science council sector over the same period. The headcount of researchers in the business sector remained almost unchanged between 2012/13 and 2013/14, while a decrease was observed in the government sector.

**Figure 22: Researchers by sector (headcount), South Africa, 2009/10 to 2013/14**

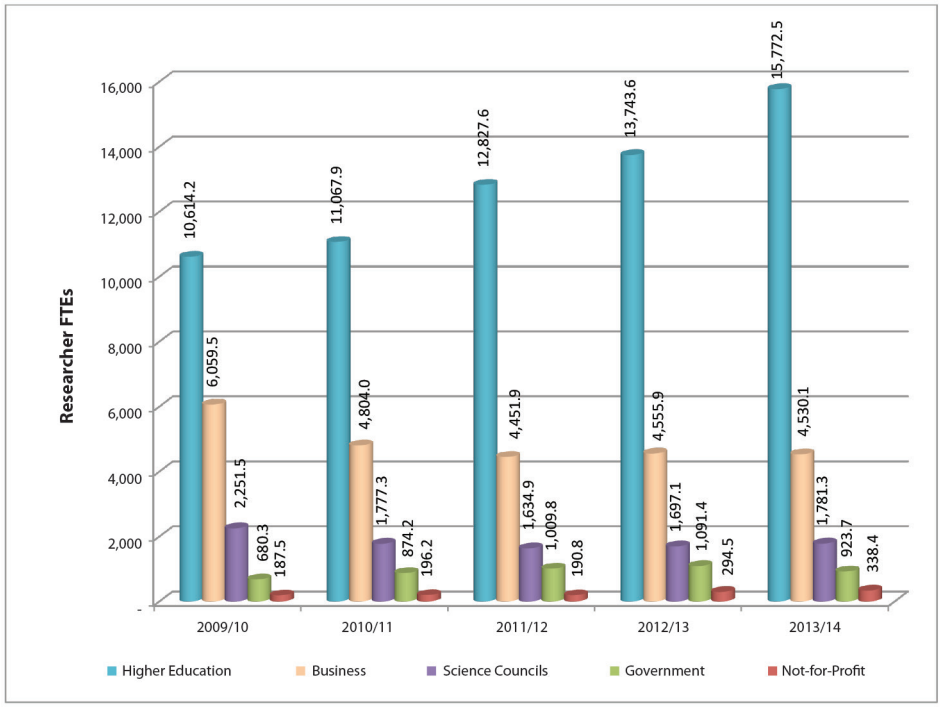



| | |
|---|---|
| Data note | Higher education R&D personnel include post-doctoral fellows and doctoral students under the 'researcher' category. |
| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

## 5.2.2 Researcher full-time equivalents (FTEs) by sector of performance

In the higher education sector, the number of researcher FTEs increased from 13 743.6 in 2012/13 to 15 772.5 in 2013/14. The not-for-profit sector experienced an increase of 77.5% in researcher FTEs between 2011/12 and 2012/13, from 190.8 in 2011/12 to 294.5 in 2012/13, and 338.4 in 2013/14. The researcher FTEs in the business, science council and government sectors followed similar trends to those observed for the corresponding researcher headcounts in these sectors. The data suggest that despite increases in the number of R&D personnel, the time that they spent on research activities did not increase proportionally.

**Figure 23: Researchers by sector (FTEs), South Africa, 2009/10 to 2013/14**

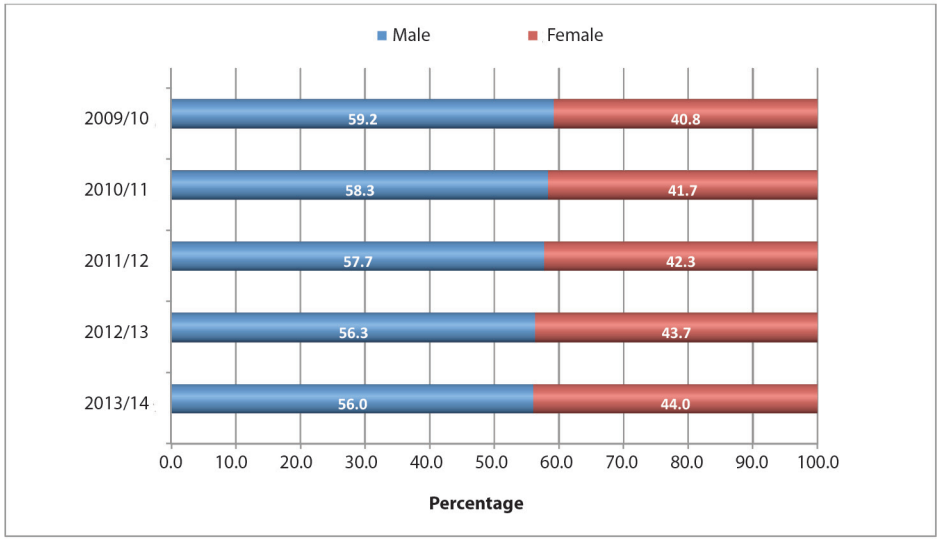



| | |
|---|---|
| Data note | Higher education researchers include post-doctoral fellows and doctoral students under the 'researcher' category. Full-time equivalent (FTE) refers to the number of hours (in terms of person-years of effort) spent on R&D activities. |
| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

## 5.2.3 Researcher headcount by gender

The 2013/14 R&D survey recorded 56.0% of researchers as male and 44.0% as female. There has been a steady annual increase in the percentage of female researchers. Figure 24 shows an increase in the percentage of female researchers from 40.8% in 2009/10 to 44.0% in 2013/14.

**Figure 24: Researchers by gender (percentage), South Africa, 2009/10 to 2013/14**




| | |
|---|---|
| Data note | Higher education R&D personnel include post-doctoral fellows and doctoral students under the 'researcher' category. |
| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

## 5.2.4 Researchers by population group

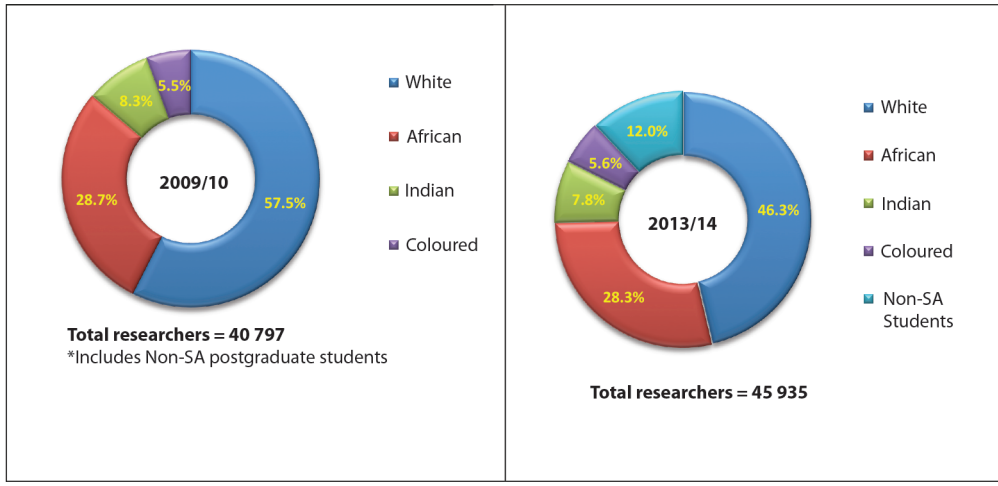
The majority of researchers in South Africa are from the White population group. This population group accounted for 46.3% of total researchers in 2013/14. Researchers from the other population groups (Africans, Coloureds and Indians), collectively, increased in proportion from 42.5% in 2009/10 to 53.7% in 2013/14.

The proportion of African researchers in 2013/14 was 28.3%, compared to 28.7% in 2008/09. In interpreting these statistics, it must be taken into account that the population group data prior to the 2011/12 survey included data on non-South African students. The percentage of Coloured researchers remained constant, at 5.5% in 2008/09 and 5.6% in

2013/14, while the percentage of Indian researchers decreased from 8.3% to 7.8% over the same period.

Non-South African students (post-doctoral fellows and doctoral students) accounted for 12.0% of researchers in 2013/14.

**Figure 25: Researchers by population group (percentage), South Africa, 2009/10 and 2013/14**

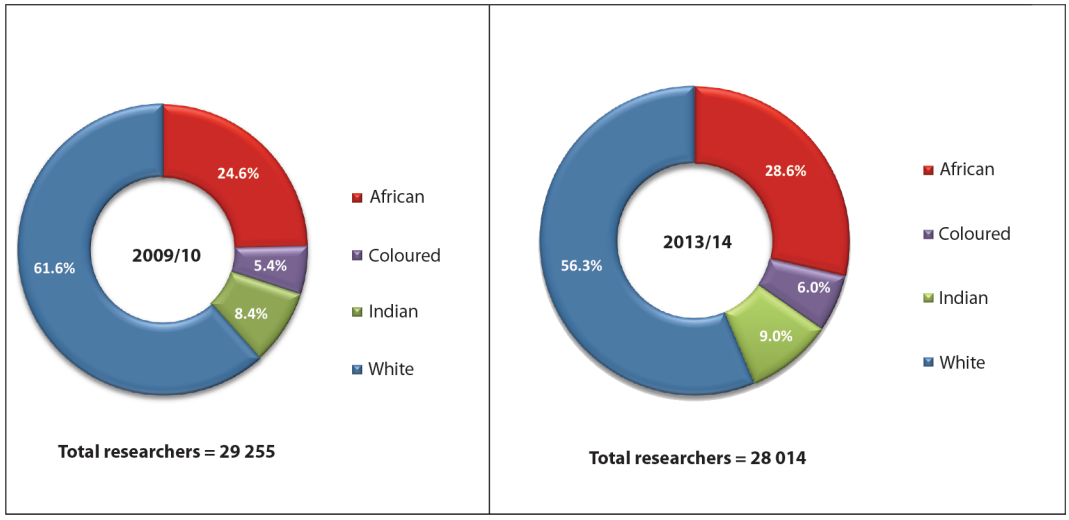



| | |
|---|---|
| Data note | *Higher education researchers include post-doctoral fellows and doctoral students under the 'researcher' category. |
| Definition | The population is classified according to the following race groups: African, Coloured, Indian and White. |
| Data source | National Survey of Research and Experimental Development, 2009/10 and 2013/14 |

## 5.2.5 Researchers (excluding doctoral students and post-doctoral fellows) by population group

The breakdown of researchers (excluding doctoral students and post-doctoral fellows) by population group in 2013/14 comprised 56.3% White researchers, 28.6% African researchers, 9.0% Indian researchers and 6.0% Coloured researchers. Excluding postgraduate students from the R&D personnel allowed the data to reveal shifts in the overall racial composition of the researcher headcount over time. The proportion of African researchers increased from 24.6% in 2009/10 to 28.6% in 2013/14; Indian researchers increased from 8.4% to 9.0%; and Coloured researchers increased from 5.4% to 6.0%. The percentage of White researchers decreased from 61.6% to 56.3% over the same period.

**Figure 26: Researchers (excluding doctoral students and post-doctoral fellows) by population group (percentage), South Africa, 2009/10 and 2013/14**

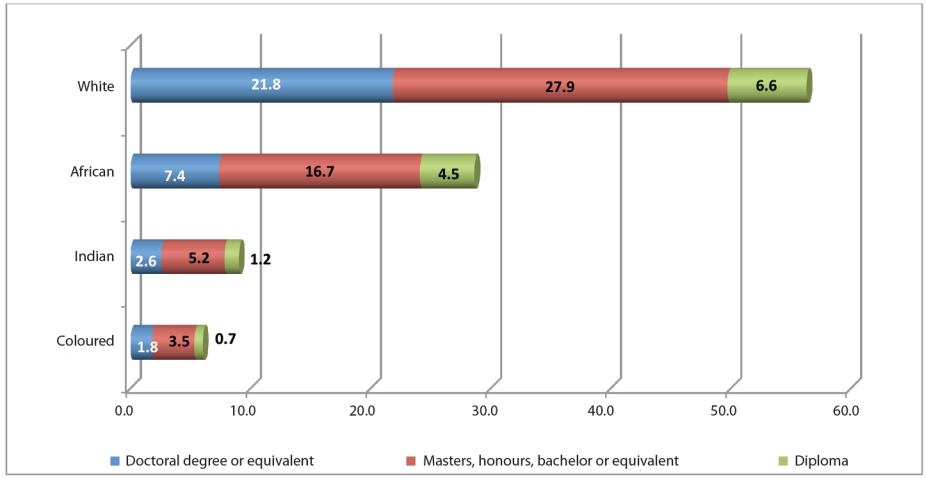



| | |
|---|---|
| Data note | For this section only, the higher education researchers do not include post-doctoral fellows and doctoral students under the 'researcher' category. |
| Definition | The population is classified according to the following race groups: African, Coloured, Indian and White. |
| Data source | National Survey of Research and Experimental Development, 2009/10 and 2013/14 |

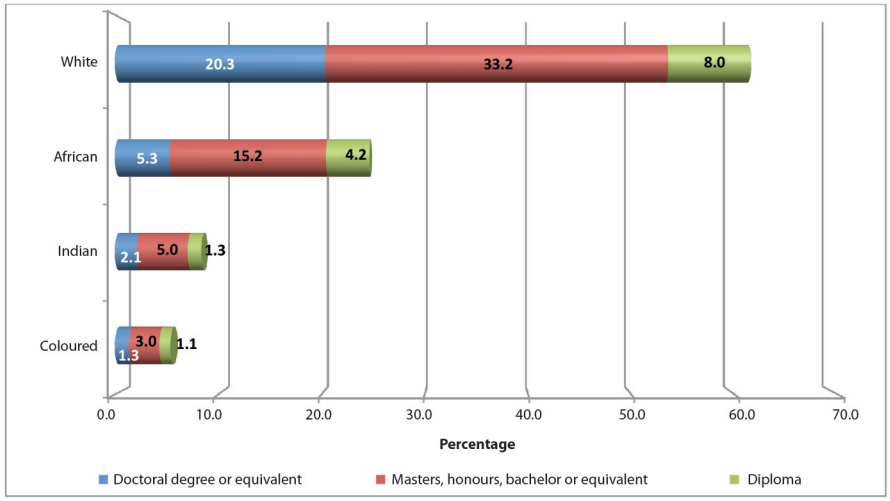
## 5.2.6 Researchers (excluding doctoral students and post-doctoral fellows) by qualification and population group

In 2013/14, 28.6% of researchers (excluding doctoral students and post-doctoral fellows) were African, an improvement on the 24.7% African researchers recorded in 2009/10. African researchers with a doctoral degree increased from 5.3% in 2009/10 to 7.4% in 2013/14. In 2013/14, White researchers accounted for the majority with a doctoral qualification (21.8%). The majority of South African researchers held a masters, honours, bachelor or equivalent degree in 2009/10 and 2013/14.

## Figure 27: Researchers (excluding doctoral students and post-doctoral fellows) by qualification and population group (percentage), South Africa, 2013/14




## Figure 28: Researchers (excluding doctoral students and post-doctoral fellows) by qualification and population group (percentage), South Africa, 2009/10



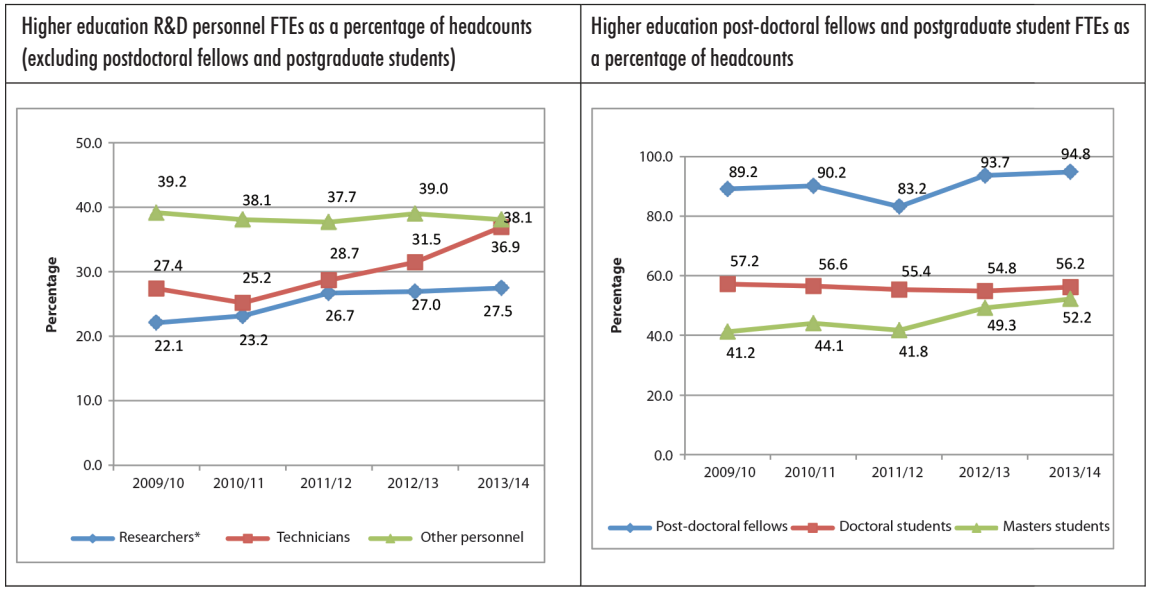

| | |
|---|---|
| Data note | For this section only, the higher education researchers do not include post-doctoral fellows and doctoral students under the 'researcher' category. |
| Definition | The population is classified according to the following race groups: African, Coloured, Indian and White. |
| Data source | National Survey of Research and Experimental Development, 2009/10 and 2013/14 |

## 5.3 Higher education R&D personnel

### 5.3.1 Higher education R&D personnel: FTEs as a percentage of head-counts

The 2013/14 R&D survey data reflected increases in headcounts and FTEs in both the R&D personnel and researcher categories. Higher education researchers (excluding post-doctoral fellows and postgraduate students) spent 22.1% of their time on research in 2009/10, and this percentage increased to 27.5% in 2013/14. Doctoral students spent 57.2% of their time on research activities in 2009/10 and 56.2% in 2013/14, while masters students spent 41.2% of their time on research in 2009/10 and 52.2% in 2013/14. Post-doctoral fellows spent most of their time performing research, as indicated by the high ratio of FTEs as a percentage of headcounts. The time that post-doctoral fellows spent on research decreased from 89.2% in 2009/10 to 83.2% in 2011/12, but this percentage improved to 94.8% in 2013/14.

**Figure 29: Higher education R&D personnel and students (FTEs as a percentage of headcounts), South Africa, 2009/10 to 2013/14**

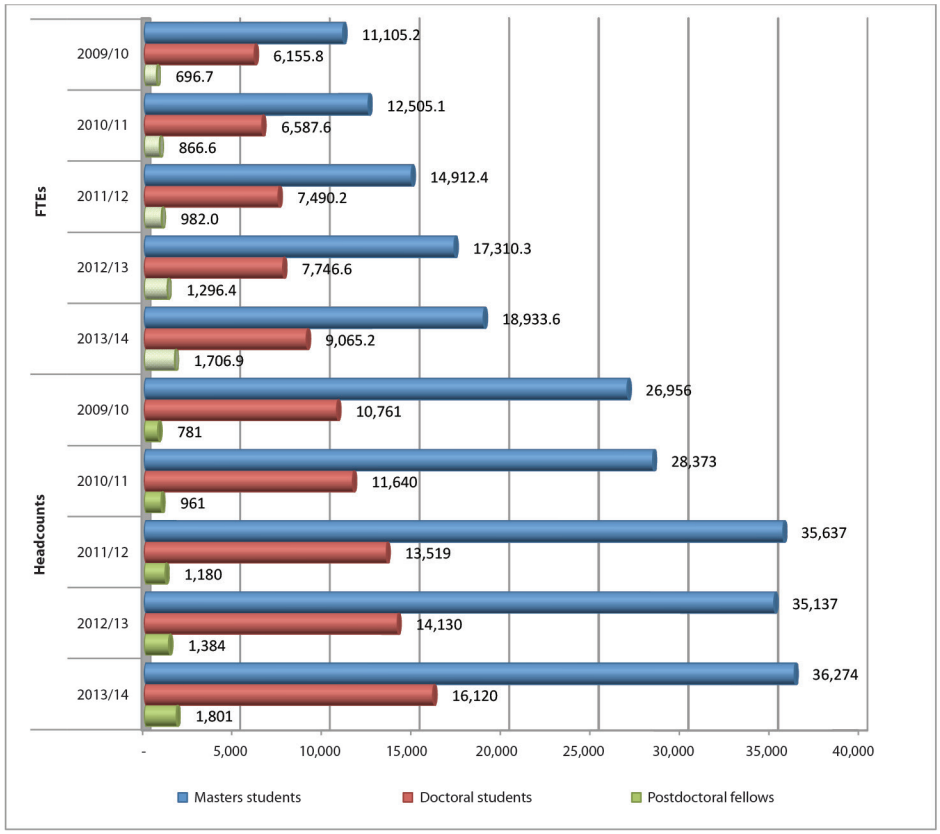



| | |
|---|---|
| Data note | FTEs as a percentage of headcounts. |
| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

## 5.3.2 Post-doctoral fellow and post-graduate student headcounts and full-time equivalents (FTEs)

The most consistent growth of R&D personnel within the higher education sector was in headcounts and FTEs among post-doctoral fellows, doctoral and masters students between 2009/10 and 2013/14. The headcount of doctoral students was 10 761 in 2009/10 and reached 16 120 in 2013/14, while the headcount of masters students increased from 26 956 in 2009/10 to 36 274 in 2013/14.

**Figure 30: Higher education post-doctoral fellows and postgraduate students (headcounts and FTEs), South Africa, 2009/10 to 2013/14**

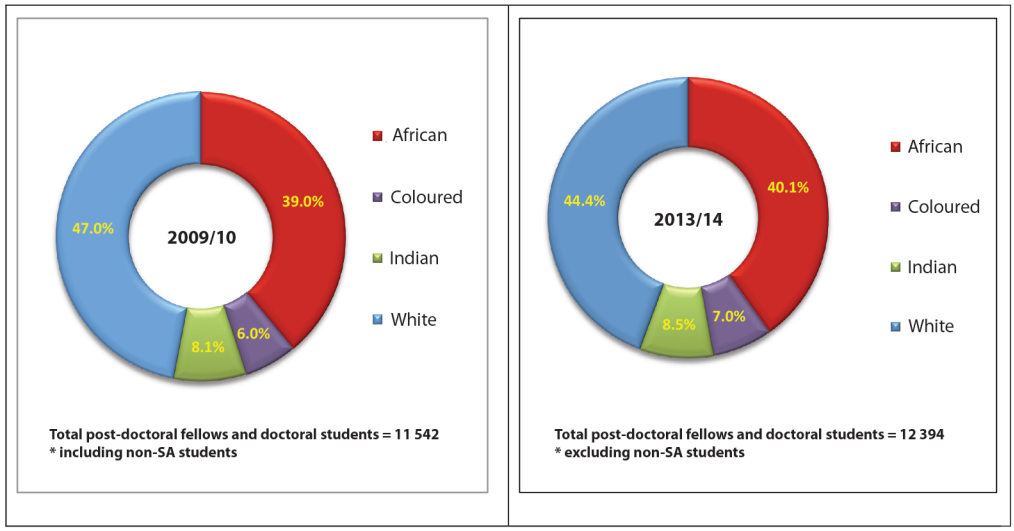



| | |
|---|---|
| Data note | Masters students are not counted as R&D personnel according to the Frascati Manual (OECD, 2002). |
| Data source | National Survey of Research and Experimental Development, 2009/10 to 2013/14 |

## 5.3.3 Post-doctoral fellows and doctoral students by population group

In 2009/10, 47.0% of all post-doctoral fellows and doctoral students were White and 39.0% were African; these included non-South African students. The figures for the 2013/14 survey excluded non-South African students. Of the South African post-doctoral fellows and doctoral students in 2013/14, 44.4% were White and 40.1% were African. The percentage of Indian postgraduate students remained almost unchanged at 8.1% in 2009/10 and 8.5% in 2013/14, while the percentage of Coloured postgraduate students increased from 6.0% in 2009/10 to 7.0% in 2013/14.

**Figure 31: Higher education post-doctoral fellows and doctoral students by population group (percentage), South Africa, 2009/10 and 2013/14**

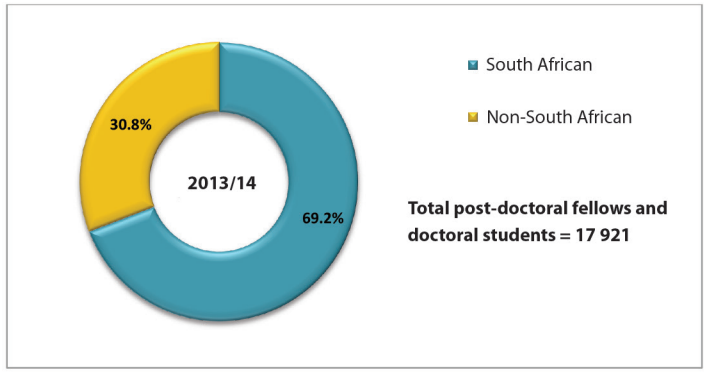



| | |
|---|---|
| Data note | The data on post-doctoral fellows and doctoral students for 2009/10 included non-South African students. The 2013/14 survey distinguished between South African and non-South African nationals. |
| Data source | National Survey of Research and Experimental Development, 2009/10 and 2013/14 |

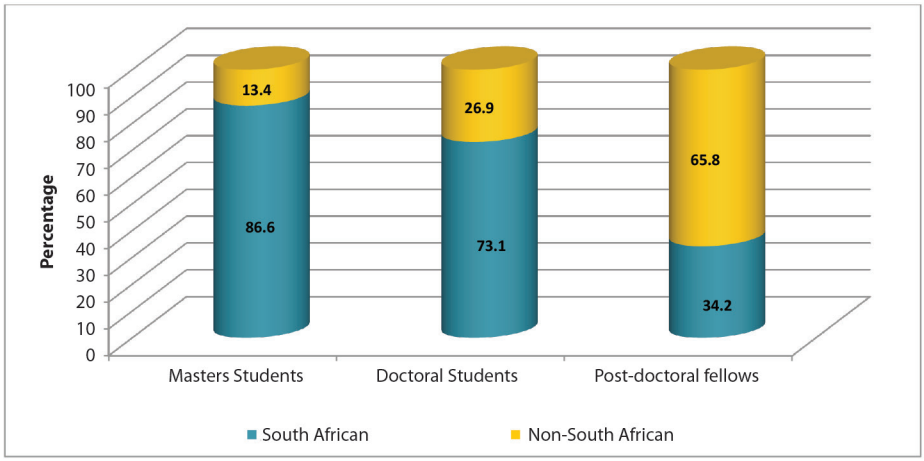
### 5.3.4 Profile of South African and non-South African postgraduate students

The 2013/14 survey captured data on doctoral students and post-doctoral fellows according to race, gender and whether they were South African nationals or not. A total of 17 921 post-doctoral fellows and doctoral students (headcount) were reported for 2013/14; of these approximately 69.2% were South African and 30.8% were non-South African. An analysis of postgraduate students by qualification for the 2013/14 survey showed that the majority of masters and doctoral students were South African nationals, but non-South African nationals were in the majority (65.8%) among post-doctoral fellows. The numbers of both foreign and South African post-doctoral fellows and doctoral students increased between 2012/13 and 2013/14.

**Figure 32: Higher education post-doctoral fellows and doctoral students by nationality (headcount), South Africa, 2013/14**



## Figure 33: Higher education postgraduates by qualification (headcount), South Africa, 2013/14




| | |
|---|---|
| Data note | The 2013/14 survey distinguished between South African and non-South African nationals. Masters students are not counted in this case.. |
| Data source | National Survey of Research and Experimental Development, 2009/10 and 2013/14 |

## Table 6: Higher education postgraduates by qualification (headcount), South Africa, 2011/12 to 2013/14

| Higher education postgraduate students | 2011/12 | | | 2012/13 | | | 2013/14 | | |
|---|---|---|---|---|---|---|---|---|---|
| | South African | Non-South African | Totals | South African | Non-South African | Totals | South African | Non-South African | Totals |
| Masters students | 29 131 | 6 506 | 35 637 | 29 364 | 5 773 | 35 137 | 31 424 | 4 850 | 36 274 |
| Doctoral students | 10 135 | 3 384 | 13 519 | 9 822 | 4 308 | 14 130 | 11 778 | 4 342 | 16 120 |
| Post-doctoral fellows | 538 | 642 | 1 180 | 511 | 873 | 1 384 | 616 | 1 185 | 1 801 |
| Total | 39 804 | 10 532 | 50 336 | 39 697 | 10 954 | 50 651 | 43 818 | 10 377 | 54 195 |

| | |
|---|---|
| Data note | The 2012/13 and 2013/14 surveys captured postgraduate students according to race, gender and whether they were South African nationals or not. |
| Data source | National Survey of Research and Experimental Development, 2011/12 to 2013/14 |

# 6. GEOGRAPHIC DIMENSIONS OF R&D

## 6.1 R&D expenditure by province

R&D activities in South Africa are geographically concentrated in three provinces, namely Gauteng, Western Cape and KwaZulu-Natal. Gauteng remains the province where most R&D takes place, accounting for 46.7% (R11.976 billion) of GERD in 2013/14. Western Cape and KwaZulu-Natal provinces together were responsible for 30% of GERD in 2013/14, with the Western Cape being responsible for R4.949 billion and KwaZulu-Natal for R2.753 billion. There was a 4.2% increase in the proportion of GERD spent in the other provinces, from 19.1% in 2009/10 to 23.3% in 2013/14. Between 2008/09 and 2013/14, Eastern Cape, North West and Free State provinces appear to have contributed the most to R&D growth outside the dominant three provinces.

**Table 7: R&D expenditure by province (R'000 and percentage), South Africa, 2009/10 and 2013/14**

| Province | 2009/10 | | 2013/14 | |
|---|---|---|---|---|
| | R'000 | % | R'000 | % |
| Eastern Cape | 1 121 484 | 5.4 | 1 478 850 | 5.8 |
| Free State | 1 370 779 | 6.5 | 1 943 131 | 7.6 |
| Gauteng | 10 377 381 | 49.5 | 11 975 916 | 46.7 |
| KwaZulu-Natal | 2 167 048 | 10.3 | 2 752 543 | 10.7 |
| Limpopo | 340 379 | 1.6 | 444 015 | 1.7 |
| Mpumalanga | 393 822 | 1.9 | 615 773 | 2.4 |
| North West | 540 951 | 2.6 | 1 027 448 | 4.0 |
| Northern Cape | 217 774 | 1.0 | 473 722 | 1.8 |
| Western Cape | 4 425 059 | 21.1 | 4 949 174 | 19.3 |
| TOTAL | 20 954 677 | 100.0 | 25 660 573 | 100.0 |

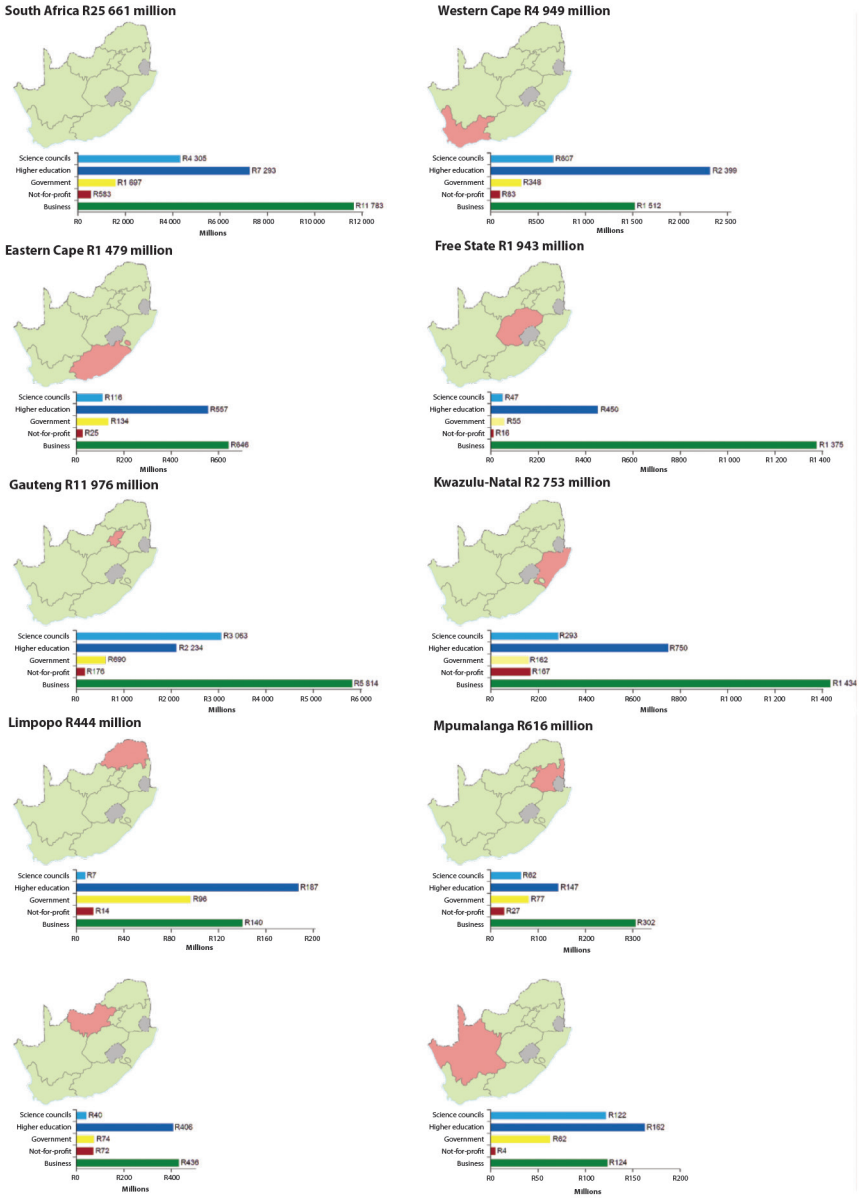
Data source: National Survey of Research and Experimental Development R&D, 2009/10 and 2013/14

## 6.2 Proportions of R&D expenditure by sector

Provincial R&D expenditure varied between the five R&D-performing sectors. The business sector was predominant with respect to R&D expenditure in the Free State (70.8%), KwaZulu-Natal (52.1%), Mpumalanga (49.0%), Gauteng (48.5%) and Eastern Cape (43.7%) provinces during 2013/14.

The highest proportions of R&D expenditure by the government sector were recorded in Limpopo (21.5%), Northern Cape (13.1%) and Mpumalanga (12.6%). The higher education sector contributed a significant proportion of R&D expenditure in the Western Cape (48.5%), Limpopo (42.2%) and North West (39.5%) provinces. In 2009/10 by comparison, the higher education sector made the biggest contribution to R&D expenditure in the Eastern Cape, Limpopo and Northern Cape provinces (Table 8).

## Figure 34: R&D expenditure by province (R million), South Africa, 2013/14




| Data source | National Survey of Research and Experimental Development R&D, 2013/14 |
|---|---|

## Table 8: R&D expenditure by province and sector of performance (R'000 and percentage), South Africa, 2009/10

| Province | Business | | Government | | Higher education | | Not-for-profit | | Science councils | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | % | R'000 | % | R'000 | % | R'000 | % | R'000 | % | R'000 |
| Eastern Cape | 320 955 | 28.6 | 100 100 | 8.9 | 536 792 | 47.9 | 8 136 | 0.7 | 155 501 | 13.9 | 1 121 484 |
| Free State | 999 554 | 72.9 | 46 155 | 3.4 | 246 298 | 18.0 | 4 418 | 0.3 | 74 355 | 5.4 | 1 370 779 |
| Gauteng | 6 120 062 | 59.0 | 396 124 | 3.8 | 1 537 166 | 14.8 | 104 420 | 1.0 | 2 219 609 | 21.4 | 10 377 381 |
| KwaZulu-Natal | 1 183 636 | 54.6 | 54 914 | 2.5 | 662 518 | 30.6 | 30 548 | 1.4 | 235 432 | 10.9 | 2 167 048 |
| Limpopo | 49 375 | 14.5 | 60 421 | 17.8 | 147 397 | 43.3 | 4 524 | 1.3 | 78 662 | 23.1 | 340 379 |
| Mpumalanga | 161 154 | 40.9 | 68 796 | 17.5 | 88 680 | 22.5 | 8 311 | 2.1 | 66 881 | 17.0 | 393 822 |
| North West | 267 528 | 49.5 | 29 176 | 5.4 | 190 570 | 35.2 | 2 382 | 0.4 | 51 295 | 9.5 | 540 951 |
| Northern Cape | 7 988 | 3.7 | 77 978 | 35.8 | 92 062 | 42.3 | 4 493 | 2.1 | 35 253 | 16.2 | 217 774 |
| Western Cape | 2 028984 | 45.9 | 233 639 | 5.3 | 1 599 741 | 36.2 | 21 609 | 0.5 | 541 086 | 12.2 | 4 425 059 |
| TOTAL | 11 139 237 | | 1 067 302 | | 5 101 224 | | 188 840 | | 3 458 074 | | 20 954 677 |

# 7. INTERNATIONAL COMPARISONS

## 7.1 Gross domestic expenditure on R&D

The purpose of this section is to present the status of R&D performance in South Africa with respect to various indicators in comparison with selected countries. The comparison took into account the differences in economic structures between countries as well as the absence of current and up-to-date data in some cases. The country selection comprised a combination of African countries that had complete datasets for their respective survey periods, newly industrialised countries, the BRICS countries and other developing countries, and some of the top R&D-performing countries.

### 7.1.1 GERD for selected countries

Total global R&D expenditure increased between 2012 and 2013 (according to UNESCO 2014 and Battelle & R&D Magazine 2014). Global R&D is concentrated in certain regions. The impact of the global economic crisis on R&D and the pace of recovery from the slowdown of 2009–2010 varied across regions. Over the past 10 years, most of the increases in R&D spending were in the Southern and Eastern Asian countries (with the exception of Japan, which has slowed down).

Table 9 shows that between 2011/12 and 2013/14, there were overall increases in GERD in terms of US dollar purchasing power parity (PPP$) for most of the selected countries except Argentina, Spain and Finland. South Africa's GERD increased from $4 308 billion in 2012/13 to $5 022 billion 2013/14, which represented an increase of 16.6%.

## Table 9: GERD for selected countries (billion current PPP$), 2011/12 to 2013/14 or latest available year

| Country | | 2011/12 | | 2012/13 | | 2013/14 |
|---|---|---|---|---|---|---|
| Argentina | | 4 592 | | 5 446 | | 4 535 |
| Mexico | | 8 058 | | * | | * |
| Turkey | | 10 826 | | 12 656 | | 13 315 |
| OECD Total | b | 1 034 024 | b | 1 107 397 | b | 1 145 045 |
| United States | d | 415 193 | e | 453 544 | | * |
| China | | 208 171 | | 293 549 | | 336 495 |
| Japan | | 148 389 | b | 151 837 | b | 160 246 |
| Germany | | 96 971 | c | 102 238 | c | 103 909 |
| France | a | 53 310 | e | 55 352 | e | 55 218 |
| Russian Federation | | 35 192 | | 37 854 | | 40 694 |
| Italy | | 25 780 | | 26 320 | e | 26 520 |
| India | c | 36 195 | c | * | | * |
| Spain | | 20 106 | | 19 556 | | 19 192 |
| Poland | | 6 409 | | 7 899 | | 7 918 |
| Finland | | 7 897 | | 7 530 | | 7 175 |
| Brazil | | 27 430 | | * | | * |
| South Africa | | 4 158 | | 4 308 | | 5 022 |
| Chile | | 1 173 | | 1 312 | | * |

| | |
|---|---|
| Data note | a) Break in series with previous year for which data are available<br>b) Secretariat estimate or projection based on national sources<br>c) National estimate or projection<br>d) Excluding most or all defence expenditure<br>e) Provisional<br>*Data not available |
| Data source | South Africa: National Survey of Research and Development, 2013/14; OECD, 2015 |

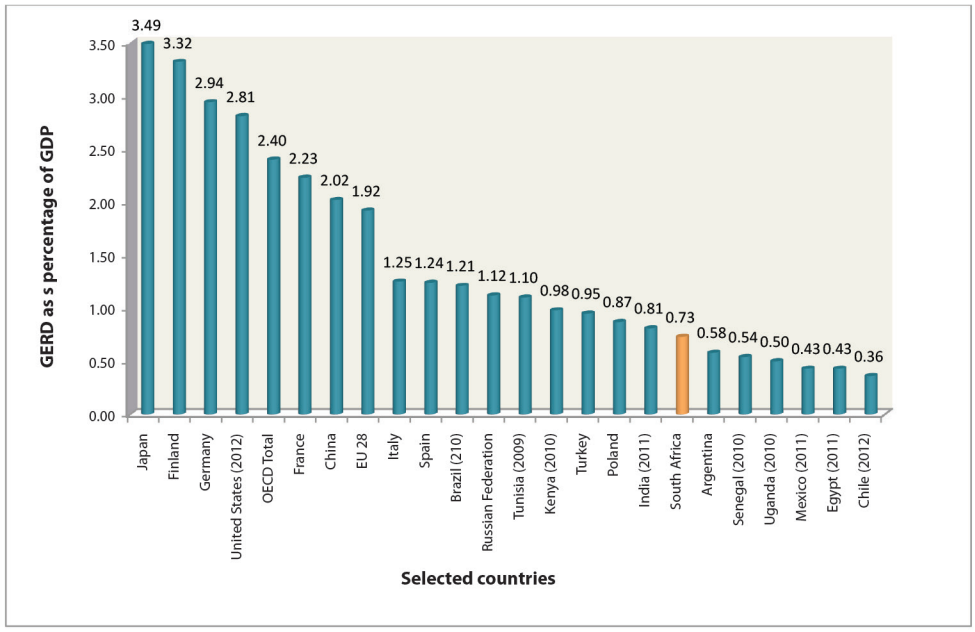
## 7.1.2 GERD as a percentage of GDP

GERD as a percentage of GDP was 0.73% for South Africa in 2013/14.

Several African countries have current R&D data for 2013/14 since the publication of the *African Innovation Outlook II* in 2014 (NPCA, 2014). GERD as a percentage of GDP varied among countries: Kenya, Senegal and Uganda reported their research intensity as 0.98%, 0.54% and 0.50% respectively. GERD as a percentage of GDP exceeded 1% for BRICS member countries other than India (0.81%) and South Africa (0.73%): China recorded R&D intensity of 2.02%, followed by Brazil at 1.21% and the Russian Federation at 1.12%.

Some research-intensive countries exceeded GERD intensity of 2.5%, including Japan (3.49%), Finland (3.32%), Germany (2.94%) and the USA (2.81%). European Union (EU) countries differ in terms of their R&D capacity; countries such as Turkey, Italy, Spain and Poland reported GERD intensities below the EU average of 1.92%.

**Figure 35: GERD as a percentage of GDP for selected countries, 2013/14 or latest available year**



| | |
|---|---|
| Data note | Reported data are for the 2013/14 financial year or the latest available year as indicated in brackets.<br>Calculations are based on current national currencies. |
| Data source | Country data:<br>South Africa: National Survey of Research and Experimental Development, 2013/14<br>Argentina, Chile, China, EU 28, Finland, France, Germany, Italy, Japan, Mexico, OECD Total, Poland, Russian Federation, Spain, Turkey, United States: OECD, 2015<br>Kenya, Senegal and Uganda: NPCA, 2014<br>Brazil, Egypt, India, Tunisia :UNESCO UIS, 2014 |

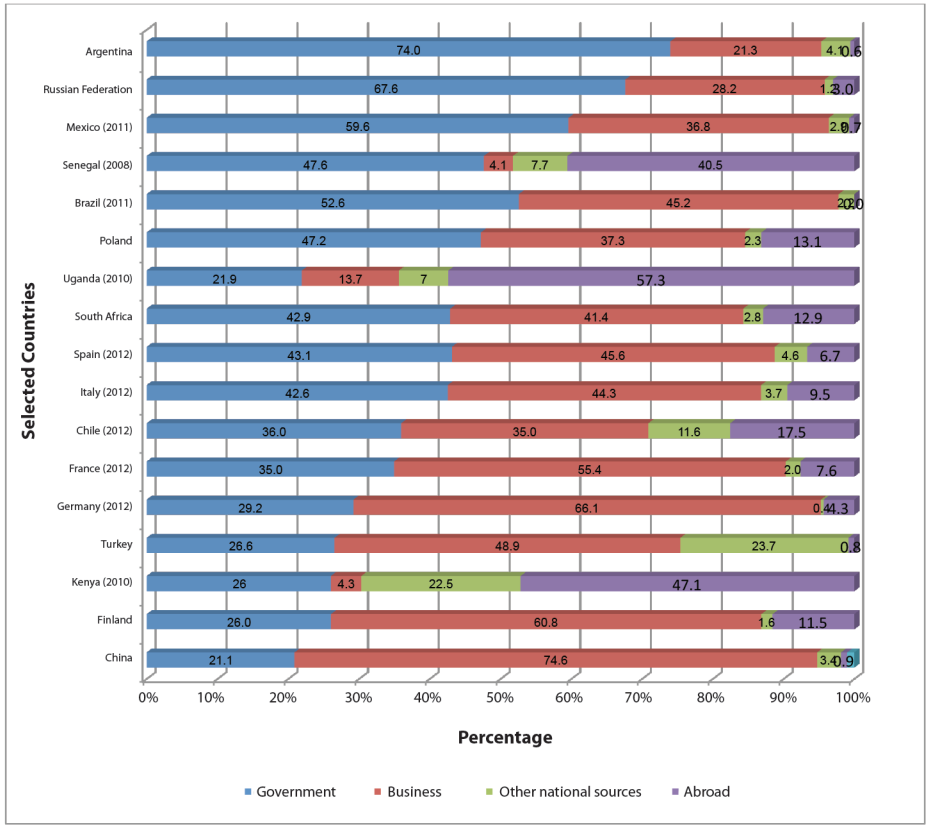
## 7.1.3 GERD by source of funds

Levels of R&D funding differ between countries, as do the proportions of expenditure among the various R&D-performing sectors. Government funding is usually predominant in low middle-income or developing countries. The not-for-profit sectors also play a major role in funding R&D in developing countries. Business is usually most active in funding R&D in research-intensive countries.

In 2013/14, South Africa received 42.9% of its R&D funding from government and 41.4% from the business sector; 2.8% of R&D funding was received from other sources, including the higher education and not-for-profit sectors, and individual donations; 12.9% of R&D funding was received from foreign sources.

Argentina, the Russian Federation, Mexico, Senegal, Brazil, Poland, Spain and Italy reported that more than 40% of their R&D funding came from government. The countries that received the largest share of R&D funding from the business sector were China (74.6%), Germany (66.1%), Finland (60.8%) and France (55.4%).

## Figure 36: GERD by source of funds in selected countries (percentage), 2013/14 or latest available year

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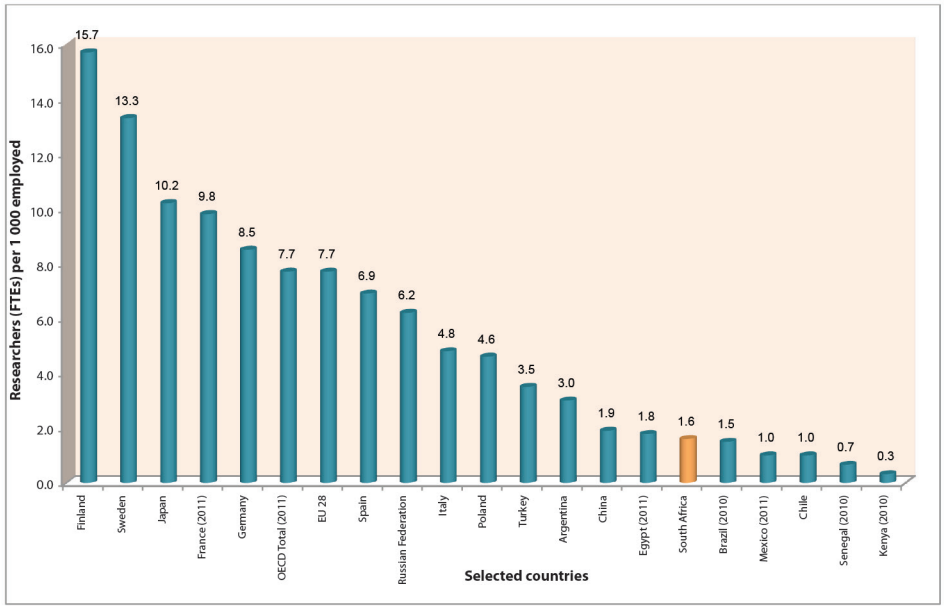
|---|---|
| Data note | Data are for 2013/14 or the latest available year as indicated in brackets.<br>Other national sources include the not-for-profit and higher education sectors. |
| Data source | Country data:<br>South Africa: National Survey of Research and Experimental Development, 2013/14<br>Argentina, Chile, China, Finland, France, Germany, Italy, Mexico, Poland, Russian Federation and Spain: OECD, 2015<br>Kenya, Senegal, and Uganda: NPCA, 2014<br>Brazil: UNESCO UIS, 2014 |

## 7.2 R&D personnel

### 7.2.3 Researcher: Full-time equivalents (FTEs) per thousand in total employment

In 2013/14, South Africa had 1.6 researcher FTEs per thousand in total employment, increasing from 1.5 of 2012/13. South Africa's figure of 1.6 was comparable with some of the BRICS countries, namely China (1.9) and Brazil (1.5). China measures particularly low on this indicator despite having the largest overall number of researchers compared to other BRICS countries. In the Russian Federation, researchers per thousand employed (6.2) were much higher than for any of the other BRICS countries. Sweden and Japan reported more than 10.0 researchers per thousand employed, while Finland reported 15.7.

**Figure 37: Researchers per 1 000 in total employment in selected countries, 2013/14 or latest available year**

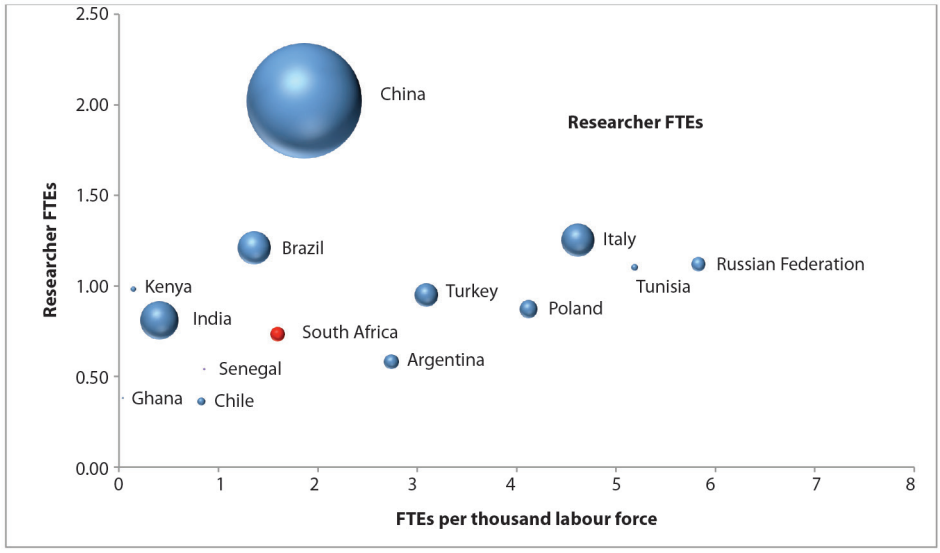



| | |
|---|---|
| Data note | Data are for 2013/14 or the latest available year as indicated in brackets. |
| Data source | Country data:<br>South Africa: National Survey of Research and Experimental Development, 2013/14Argentina, Chile, China, EU 28, Finland, France, Germany, Italy, Japan, Mexico, OECD Total, Poland, Russian Federation, Spain, Sweden, Turkey: OECD, 2015<br>Kenya, Senegal: NPCA, 2014, Brazil, Egypt: UNESCO UIS, 2014 |

## 7.2.2 Research and researcher intensity

Researcher intensity is calculated as researcher FTEs as a percentage of the labour force in the country. Figure 38 shows GERD as a percentage of GDP (research intensity) and researcher intensity for selected countries in 2013/14 or the latest year for which data are available. As in 2013/14, the Russian Federation continued to have more researcher FTEs per thousand employed than any of the other selected countries. The selected African countries, with the exception of Tunisia and South Africa, had less than one researcher FTE per thousand in the labour force.

**Figure 38: Researchers and researcher intensity, 2013/14 or latest available year**

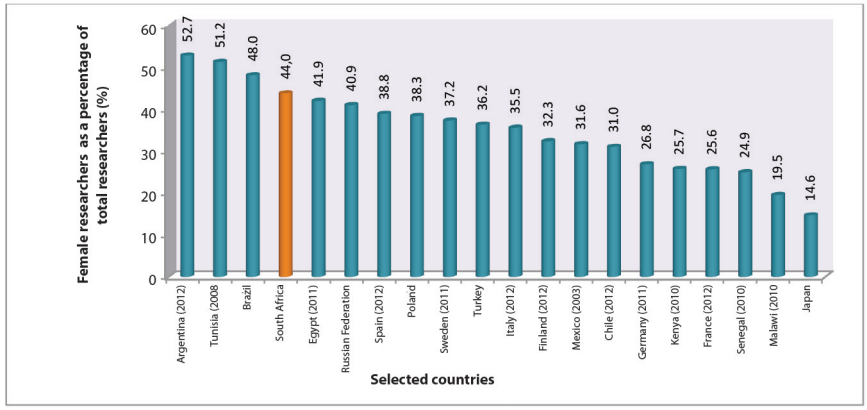



| | |
|---|---|
| Data note | The years for which data were available were as follows:<br>2013/14: Argentina, Chile, China, Italy, Poland, Russian Federation, South Africa, Turkey<br>2008/09:Ghana<br>2006/08: Kenya and Senegal:<br>2008, 2009:: Tunisia: FTE and GERD/GDP respectively<br>2010, 2011: India: Fend GERD/GDP respectively |
| Data source | Country data:<br>South Africa: National Survey of Research and Experimental Development, 2013/14<br>GERD PPP$ data:<br>Argentina, Chile, China, Italy, Poland, Russian Federation, Turkey: OECD, 2015<br>Brazil, Ghana, Kenya, Senegal: UNESCO UIS, 2014<br>FTEs per thousand: UNESCO UIS, 2014<br>GERD/GDP data: UNESCO UIS, 2014 |

## 7.2.3 Female researchers as a percentage of total researchers

In South Africa and several other middle-income countries, more than 40% of the researchers are female, which is a higher proportion than for most of the countries with high R&D expenditure performance. The proportion of female researchers in South Africa was 44.0% of total researchers in 2013/14. This indicator has been increasing gradually over the last eight years.

**Figure 39: Female researchers as a percentage of total researchers (headcount) in selected countries, 2013/14 or latest available year**




| | |
|---|---|
| Data note | Data for female researchers as a percentage of total researchers were not available for most countries.<br>The year of the latest available data is indicated in brackets.<br>The headcounts represent the number of female researchers divided by the total number of researchers. |
| Data source | Country data:<br>South Africa: National Survey of Research and Experimental Development, 2013/14<br>Argentina, Chile, Finland, France, Germany, Italy, Japan, Mexico, Poland, Russia, Spain, Sweden, Turkey: OECD, 2015<br>Kenya, Malawi, Senegal: NPCA, 2014<br>Brazil, Tunisia, Egypt: UNESCO UIS, 2014 |

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# ANNEXURE I

## Methodology

The survey was conducted according to the OECD guidelines presented in the Frascati Manual. The Frascati Manual defines R&D as follows:

> *Research and experimental development (R&D) is creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humanity, culture and society, and the use of this stock of knowledge to devise new applications. (OECD, 2002)*

The Frascati Manual proposes several approaches to surveying R&D-performing entities, including a census, a sample survey or a hybrid of the census and sample survey approaches, comprising a census of all large R&D performers and a stratified random sample survey of the remaining R&D-performing entities. In South Africa, the survey is currently conducted using the census approach in all the sectors except the business and not-for-profit (NPO) sectors, where in each case a purposive sample of the entities is surveyed. As with the previous R&D surveys, the 2013/14 survey followed this approach. In accordance with the Frascati Manual, the survey covered the following sectors: business, government, higher education, not-for-profit and science council sectors.

The sectors were surveyed during the period June 2014 to January 2015.

For science councils and all government departments, the survey covered expenditure in the year beginning 1 April 2013 and ended 31 March 2014. The data collected for the business and NPO sectors were for the financial year ended 28 February 2014 (or the nearest complete financial year). Data for the higher education sector correspond to the 2014 academic (calendar) year. Therefore, the survey mainly recorded R&D activities that took place in the 2013/14 fiscal year.

In addition to following the guidelines in the Frascati Manual, the survey was conducted according to a project plan aligned with the phases of the Statistical Value Chain (SVC), as described in the South African Statistical Quality Assessment Framework (SASQAF). As with previous surveys, the survey was conducted so as to ensure that it is compliant with certain

SASQAF criteria for data quality on official statistics, as detailed in the Quality Management Plan (QMP). The resultant reports were subjected to a data quality clearance process, managed by a clearance committee established by the DST especially for that purpose.

The full and detailed methodology is presented in the Technical Notes section of the Statistical Report.

# ANNEXURE II

## Dissemination

This report may be downloaded free of charge from:

http://www.dst.gov.za/index.php/resource-center/rad-reports

http://www.hsrc.ac.za/en/media-briefs/cestii/research-and-development-survey-released

## Data extractions

Data extractions in response to users' special data requests are generally provided free of charge, unless fairly substantial analytical work is required to meet any such request. Such data extractions are done in accordance with the approved data access protocol, and requests should be sent to msithole@hsrc.ac.za.

## Revisions

The Department of Science and Technology (DST), Statistics South Africa (Stats SA) and the Human Sciences Research Council's Centre for Science, Technology and Innovation Indicators (HSRC-CeSTII) jointly reserve the right to revise the data, indicators and analysis contained in this report. Such revisions may result from revisions by Stats SA of socio-economic indicators such as the gross domestic product (GDP), or population or employment numbers, or amendments in response to internal or external data quality and consistency monitoring such as that carried out by the Organisation for Economic Co-operation and Development (OECD), which conducts quality checks through global comparative analysis, time-series analyses and other methods. Explanations of any revisions will be made available and accessible on the DST and HSRC websites.

# ANNEXURE III

## User Satisfaction Survey

In order to improve the quality and relevance of the R&D statistics, it would be useful to receive the views of users of this publication. It would therefore be appreciated if you could complete the following questionnaire and return by fax to +27 (0)21 461 1255 or by e-mail to CeSTIIData@hsrc.ac.za. The feedback is analysed following each survey cycle to ensure the continued improvement of the R&D survey.

1. Name and address of respondent:

| | |
|---|---|
| Name and title | |
| Designation/ occupation | |
| Name and address of organisation or enterprise | |

2. Which of the following describes your area of work? Mark with 'X'.

| | | | |
|---|---|---|---|
| Government | | International organisation | |
| Private enterprise | | Media | |
| Public enterprise | | Not-for-profit organisation | |
| Academic or research institution | | Other, specify | |

3. In which country do you work?

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| |

4. What is your assessment of the content of this publication?

Excellent ☐ Good ☐ Average ☐ Satisfactory ☐ Poor ☐

5. How useful is this publication for your work?

Extremely useful ☐ Very useful ☐ Useful ☐ Partly useful ☐ Not at all useful ☐

6. How accurate is the picture of R&D in your sector or research field(s) as presented in this publication?

Very accurate ☐ Fairly accurate ☐ Unsure ☐ Not very accurate ☐ Not at all accurate ☐

7. How easy was it to find specific information that you required in the publication?

Extremely easy ☐ Very easy ☐ Easy ☐ Not very easy ☐ Not at all easy ☐

8. What information (i.e. tables, text or figures) were of most interest to you? Please be as specific as possible (e.g. provide table, page or figure numbers).

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9. What did you like best about the publication?

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10. Provide any comments or recommendations for the improvement of the publication.

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