MAIN ANALYSIS REPORT
2014/15

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

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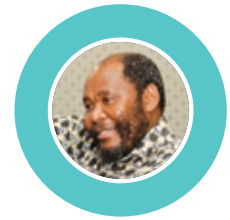
FOREWORD



The National Survey of Research and Experimental Development (R&D Survey) is the primary source of aggregate statistics on expenditure and the human capital devoted to R&D in a given period. The survey contributes to a body of official statistics and helps to report the country's progress in R&D as a critical element for development and economic transformation, both in South Africa and in the global context.

The Department of Science and Technology (DST) oversees the production of this survey as a partner within the South African National Statistics System (SANSS). This arrangement is consistent with the Statistics Act (No. 6 of 1999) and enables the Statistician General (SG) to coordinate statistical production in the country, even beyond the confines of Statistics South Africa (Stats SA). Accordingly, the survey is subject to an ongoing process of quality assessment in terms of the South Africa Statistical Quality Assessment Framework (SASQAF) to ensure that the survey remains credible and true to its purpose. The quality assessments undertaken in every instance prior to publication of the R&D survey since 2010 have reported consistent improvements in key indicators of statistical quality.

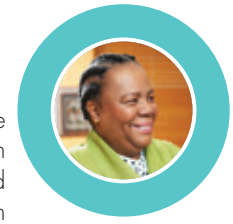
The survey quality Clearance Committee noted that the 2014/15 R&D Survey was conducted following good practices and met most of the set quality requirements even though the timeliness dimension is of serious concern. The ongoing efforts for expanding the universe targeted for the business sector and the not-for-profit sectors altered some quality indicators: additional units covered in these sectors led to higher out-of-scope rate overall, and as a result, the questionnaire response rate declined from 85.4% in 2013/14 to 67.9% in 2014/15; collection rate, a new indicator introduced in the 2012/13 survey, was 75.9%. Indications are that R&D in South Africa is concentrated in few large R&D performing units across institutional sectors, thus requiring the survey to purposely cover such units. Monitoring of the aforementioned quality indicators must continue as the survey stabilises its population of likely R&D performing units. Greater effort is required to substantially improve the timeliness indicators.

New uses of R&D statistics in the country and the recent publication of the new version of international guidelines used for this survey (i.e. *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*) puts new requirements to the conduct of this survey in South Africa. Statistics South Africa and the DST have begun a process to scope the likely enhancements to the survey going forward.

Given my assessment of the recommendation of the Clearance Committee for this survey, I endorse the 2014/15 R&D Survey results and encourage its use by stakeholders.

PALI J LEHOHLA,
STATISTICIAN GENERAL, REPUBLIC OF SOUTH AFRICA

PREFACE



In the two decades of implementing the 1996 White Paper on Science and Technology, the system for research and development (R&D) in South Africa has advanced. South Africa's R&D sector has now expanded and become more sophisticated and further integrated in the global system than it was then.

As we update the policy approach for the period ahead, the National Survey of Research and Experimental Development (R&D Survey) serves as an important source of evidence informing policy review and planning. The survey is not only an instrument for government to track policy targets, but also for use by a wide range of stakeholders as reference for statistics on the country's performance on key indicators: the size, growth and composition of R&D expenditure, and the human capital devoted to R&D.

The 2014/15 R&D survey shows an improving positive outlook for R&D investment in South Africa. Gross expenditure on research and development (GERD) increased by 8.1% in real terms from 2013/14 to 2014/15. This is the fourth consecutive year that GERD has increased in real terms, after the contraction in 2009/10. At R23.3 billion in 2014/15, GERD in constant 2010 rand terms has almost reached the peak of R24.1 billion that was achieved in 2008/09. It is encouraging that the business sector, and particularly the manufacturing industry, has shown an acceleration in R&D expenditure, contributing the most to the reported increase in GERD.

GERD as a percentage of Gross Domestic Product (GDP), an indicator of R&D intensity in the economy, was 0.77% in 2014/15, an improvement from 0.73% that was reported in the three consecutive previous surveys. However, this improvement takes place in conditions of a slowing rate of GDP growth, which was 2.2% in 2013 and 1.5% in 2014. Ideally, such an improvement should occur in an environment of strong GDP growth.

With respect to indicators to R&D personnel, the ratio of full-time equivalent researchers per 1 000 employed has stagnated between 1.4 and 1.6 for the past 10 years. This indicates that greater effort is required to expand the researcher workforce, which has grown at an equivalent rate to that of overall employment in the economy.

The policy focus on increasing R&D expenditure – to 1.5% – remains, and continues to be monitored as part of the government's Medium Term Strategic Framework (2014-2019).

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

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

Naledi Pandor

GNM PANDOR, MP
MINISTER OF SCIENCE AND TECHNOLOGY

ACKNOWLEDGEMENTS

The South African National Survey of Research and Experimental Development is conducted annually by CeSTII on behalf of the DST.

The authors of this report extend their appreciation to Dr Phil Mjwara (Director-General of the DST), Professor Crain Soudien (CEO of the HSRC), Dr Leickness Simbayi, (Deputy CEO: Research of the HSRC), Dr Glenda Kruss (Deputy Executive Director, CeSTII) and Mr Pali Lehohla (Statistician-General), for their support of the 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 greatly appreciated. Technical inputs and advice by the DST and Stats SA teams, as well as from the Clearance Committee for Science, Technology and Innovation Statistical Reports 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: Neo Molotja, Mario Clayford, Jerry Mathekga, Theodore Sass, Helen Morrisey, Sinovuyo Takatshana, Lwando Kondlo, Loyiso Maciko, Kesewaa Koranteng, Precious Mudavanhu, Farzanah Frieslaar, Maria Maluleke, Gina Mshengu, Nazeem Mustapha, Saahier Parker, Natasha Saunders, Moses Sithole, Natalie Vlotman, Hlamulo Makelane, Gerard Ralphs, and Lindiwe Binda.

ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
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 and Communication Technology
NESTI	National Experts on Science and Technology Indicators
NPO	Not-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
SIC	Standard Industrial Classification
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 Organization

DEFINITION AND DESCRIPTIONS

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.

FTE per 1 000 in total employment: Number of professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, as well as in the management of these projects during a given year expressed as a proportion of 1,000 employed people. It is calculated by number of researchers during a given year divided by the total employed people and multiplied by 1 000.

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.

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 reporting unit 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%.

EXECUTIVE SUMMARY

The National Survey of Research and Experimental Development presents statistical indicators about the level 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. 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 2014/15 R&D survey, which is the thirteenth in the series produced by CeSTII.

The total R&D expenditure in South Africa amounted to R29.345 billion in 2014/15.

This represents a nominal increase of 14.4% from the R25.661 billion recorded in 2013/14. At constant 2010 Rand value, GERD amounted to R23.257, which is a real increase of 8.1% from R21.515 billion in 2013/14.

GERD as a percentage of GDP increased from 0.73% to 0.77%.

GERD as a percentage of gross domestic product (GDP) or R&D intensity was 0.77% in 2014/15, an increase from 0.73% in 2013/14. The calculations are based on the rebased and revised GDP series first published in November 2014 by Stats SA. The GDP data series was revised upwards, with the figures dating from 1993/94 onwards. GERD as a percentage of GDP remained at 0.73% for the years 2011/12 to 2013/14.

GERD increased for all sectors of the economy.

The business sector was the largest performer of R&D in 2014/15, with expenditure amounting to 45.3% of GERD. The higher education sector accounted for the second-largest expenditure on R&D at 28.5% of GERD. This is an improvement in HERD given that expenditure decreased by R40 million (0.5%) in the 2013/14 survey cycle. Expenditure on R&D by science councils accounted for 17.1% of GERD, followed by government at 6.5%, while the R&D expenditure recorded for not-for-profit organisations increased by 2.7%.

The government and business sectors continue to be the largest funding sources for R&D.

Government funding of R&D increased by 17.0% from R11.007 billion in 2013/14 to R12.873 billion in 2014/15, representing 43.9% of total R&D funding. Of these, government institutions and higher education received 46.8% (R6.031 billion and R6.021 billion respectively) of the total government R&D funding. The business sector was the second-largest funder of R&D, contributing 40.8% (R11.982 billion) towards total R&D funding. Business R&D expenditure financed by industry, that is own and other business funds, constituted 90.2% of R11.982 million. Higher education and science councils received most of the remaining funds, R885 million and R223 million respectively.

The third-largest source of funding for R&D in 2014/15 was from abroad, amounting to 12.2% (R3.566 billion), an increase of 7.6% from R3.315 billion in 2013/14.

R&D personnel headcounts and FTEs continued to grow.

The higher education sector has the majority of R&D personnel. Researchers accounted for the largest proportion of R&D personnel in this sector, although the most consistent growth of R&D personnel within the higher education sector between 2009/10 and 2014/15 was in headcounts and FTEs of postgraduate students.

In the 2014/15 R&D survey, all sectors except government and science councils reported increases in R&D personnel FTEs. The highest numbers of FTEs were in higher education (17 944.4) and the business sector (12 927.5). The 2014/15 survey recorded a 1.3% increase in FTEs for the total R&D personnel between 2013/14 and 2014/15, counter to the 8.3% recorded between 2012/13 and 2013/14.

South Africa follows global trends for recovering R&D spending.

R&D trends around the globe indicate that there is renewed interest in investing in R&D after the 2008-2010 economic crisis. Within the BRICS, China has shown the highest growth in R&D investments. South Africa's investment in R&D is growing in nominal terms and in 2014/15 the increase in GERD was greater than increases in the level of GDP. 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.

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INTRODUCTION

This report provides analysis and commentary on the results of the 2014/15 South African National Survey of Research and Experimental Development.

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 report is divided into seven themed sections. Section 1 provides a contextual overview of the survey, indicators, measurements as well as a brief summary of key indicators. Section 2 to Section 4 provides expenditure on R&D by categories. Section 5 outlines people in R&D. Section 6 is about the geographical distribution of R&D in South Africa and Section 7 outlines international performance of R&D of selected countries. Section 8 summarises the 2014/15 R&D survey.

The description of the survey methodology on measurement and classification issues is contained in Annex I of this report.

1. R&D INDICATORS: TRENDS, PERFORMANCE AND THEIR USE IN SOUTH AFRICA

Science, technology and innovation indicators should by their nature enable a country to measure, monitor and evaluate its scientific and innovative capabilities. In their many possible uses, indicators should be designed to provide information for decision making and policy development, predict future trends, identify priorities and be used by researchers. Science, technology and innovation are evolving at a faster rate than in the past, and indicators should be designed to reflect this phenomenon. R&D indicators are the most widely used, and continue to influence the further development and usage of STI indicators.

The focus of this report is on R&D indicators. R&D trends around the globe indicate that there is renewed interest in investing in R&D after the 2008-2010 economic crises. Economic growth foments R&D growth. Countries in the high-income categories are increasing their spending on R&D. Within the BRICS set of countries, China and India have demonstrated growth in their investments. Together with Japan and South Korea, these countries account for 40% of global R&D (Battelle & R&D Magazine, 2016). South Africa's investment in R&D is growing in nominal terms and, in 2014/15, real growth in GERD was larger than real growth in GDP at 1.0% and 1.5% respectively. The OECD Science, Technology and Industry Scoreboard indicates that R&D is concentrated, with only 2 000 leading R&D firms (and their 500 000 affiliates) accounting for 90% of R&D conducted worldwide (OECD, 2015b). South Africa must be counted among these, to make an impact on its economic growth.

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, 2002/2015a) has helped a great deal in this regard. South Africa, through CeSTII and its stakeholders, will continue to enhance and develop new methodologies and use existing methodologies to develop new measures.

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, as shown in Table 1.

The R&D survey has since 2013/14, incorporated two important developments in the broader environment of R&D measurement. The first is the revision and rebasing of the GDP that was announced by Stats SA in November 2014. This necessitated the revision of GERD/GDP based

on the revised GDP series, which was applied for the first time in the 2013/14 R&D survey and this will be applied to R&D data going forward. 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.

1.1 Key indicators

The key indicators for 2014/15 are presented in Table 1 in comparison with the indicators for 2013/14 and 2012/13.

Table 1: Key R&D indicators, South Africa, 2014/15 with comparative figures for 2013/14 and 2012/13

KEY INDICATOR	VALUE		
	2012/13	2013/14	2014/15
Gross domestic expenditure on R&D (GERD) (Rand million)	23 871	25 661	29 345
Gross domestic product (GDP) at current prices (Rand million)	3 262 542	3 534 326	3 796 462
GERD as a percentage of GDP (%)	0.73	0.73	0.77
Civil GERD as a percentage of GDP (%)	0.72	0.69	0.72
Basic research (Rand million)	6 031	6 102	7 133
Total R&D personnel (FTE*)	35 050.3	37 956.5	38 465.0
Total researchers (FTE*)	21 382.4	23 346.0	23 571.9
Total researchers (FTE*) per 1 000 in total employment	1.5	1.6	1.5
Total R&D personnel (FTE*) per 1 000 in total employment	2.4	2.5	2.5
Total researchers (headcount)	42 828	45 935	48 479
Female researchers (headcount) as a percentage of total researchers (%)	43.7	44.0	44.3

Data note	* FTE = Full-time equivalent.
Data sources	South African National Survey of Research and Experimental Development, 2012/13 to 2014/15 GDP values: Stats SA, GDP, 4th Quarter 2015, P0441 Total employment value: Stats SA, Labour Force Survey, P0211

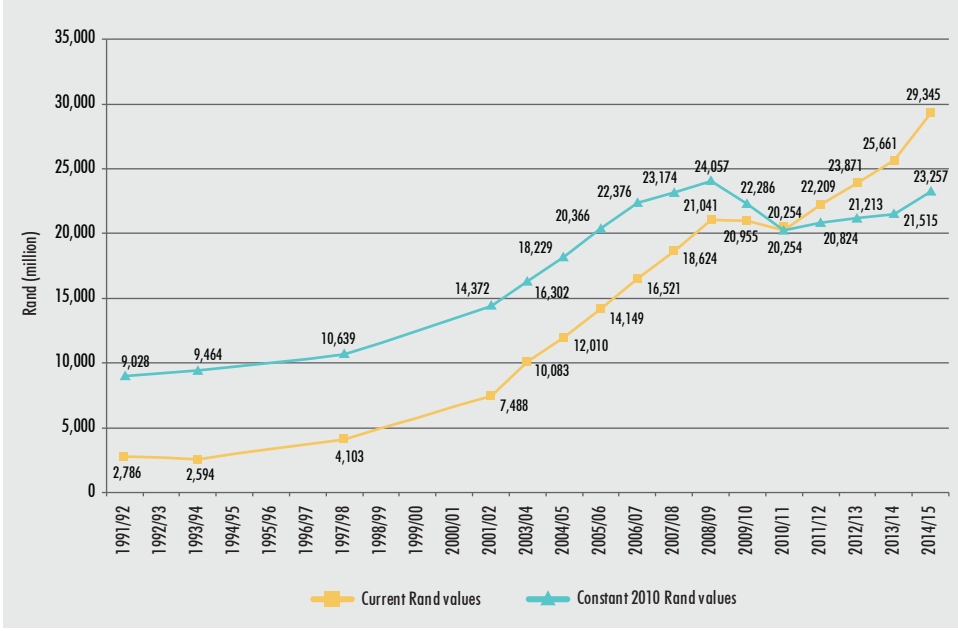
2. R&D EXPENDITURE

2.1 Gross domestic expenditure on R&D

South Africa spent R29.345 billion on R&D in 2014/15. This represents a nominal increase of 14.4% from the R25.661 billion recorded in 2013/14. At constant 2010 Rand values, gross domestic expenditure on R&D (GERD) amounted to R23.257 billion in 2014/15, which was an increase of R174 million from R21.515 billion in 2013/14.

During 2014/15, R&D expenditure increased in all five sectors.

Figure 1: GERD in current and constant 2010 Rand value (R million), South Africa, 1991/92 to 2014/15

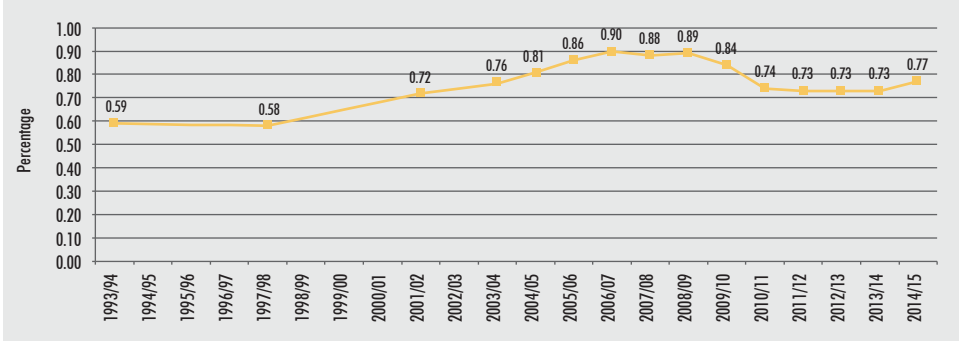


Data note	GDP deflator values derived from the fourth quarter release of the Stats SA GDP series P0441 (Stats SA, 2014) were used to calculate constant 2010 Rand values for R&D expenditure.
Data sources	Revised GDP (current values): Stats SA, GDP, 4th Quarter 2015, P0441 R&D expenditure: National Survey of Research and Experimental Development, 2001/02 to 2014/15. 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 0.77% in 2014/15. This indicator has been at 0.73% for the three years since 2011/12 consecutively, and it has increased slightly by 0.04 percentage points. 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 continued to increase, but not at the same rate as the increase in the level of GDP. The GERD/GDP level is yet to increase and surpass the highest level of 0.90% it had reached in 2006/07.

Figure 2: GERD as a percentage of GDP, South Africa, 1993/94 to 2014/15



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, 4th Quarter 2015, P0441 R&D expenditure: National Survey of Research and Experimental Development, 2001/02 to 2014/15. R&D expenditure for the period prior to 2001/02 was sourced from archived data (DNE, 1993; DACST, 1996; DACST, 2000) R&D intensities prior to GDP revision: National Survey of Research and Experimental Development, 2014/15

2.3 GERD by sector

The business sector was the largest performer of R&D in South Africa in 2014/15, with business expenditure on R&D (BERD) amounting to R13.291 billion. Although there were decreases in the level of investment in R&D by business enterprises during 2009/10 and 2012/13, this sector remains the largest performer throughout the history of the South African R&D survey. BERD at constant rand prices amounted to R10.533 billion, which is equivalent to 45.3% of GERD.

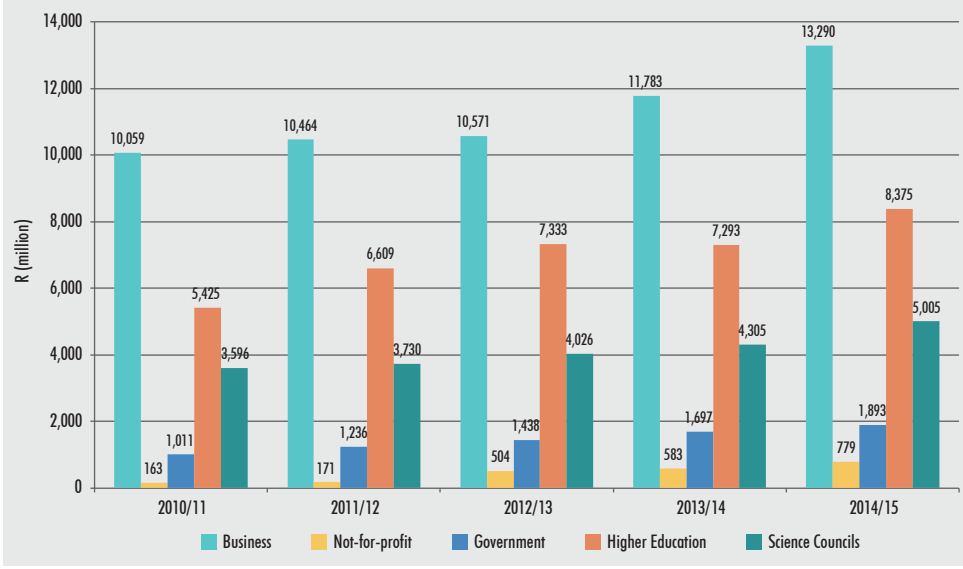
The second largest performer of R&D was higher education. The higher education expenditure on R&D (HERD) increased from R7.293 billion in 2013/14 to R8.378 billion in 2014/15. At constant 2010 Rand value, this represented an 8.6% increase in R&D expenditure from R6.115 billion in 2013/14 to R6.639 billion in 2014/15.

Expenditure on R&D by science councils grew from R4.305 billion in 2013/14 to R5.005 billion in 2014/15. At constant 2010 Rand value, this accounted for 17.1% of total GERD and represented a 9.9% increase from R3.609 billion in 2013/14 to R3.966 billion in 2014/15.

Government expenditure on R&D (GOVERD) increased in current Rand value from R1.697 billion in 2013/14 to R1.893 billion in 2014/15. At constant 2010 Rand value, this represented an increase of 5.4% from R1.423 billion in 2013/14 to R1.500 billion in 2014/15.

Not-for-profit organisations recorded an increase in R&D expenditure from R583 million in 2013/14 to R779 million in 2014/15, mainly due to better coverage. At constant 2010 Rand value, this represented a 26.2% increase from R489 million in 2013/14 to R617 million in 2014/15.

Figure 3: R&D expenditure by sector (R million), South Africa, 2010/11 to 2014/15



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, 2010/11 to 2014/15

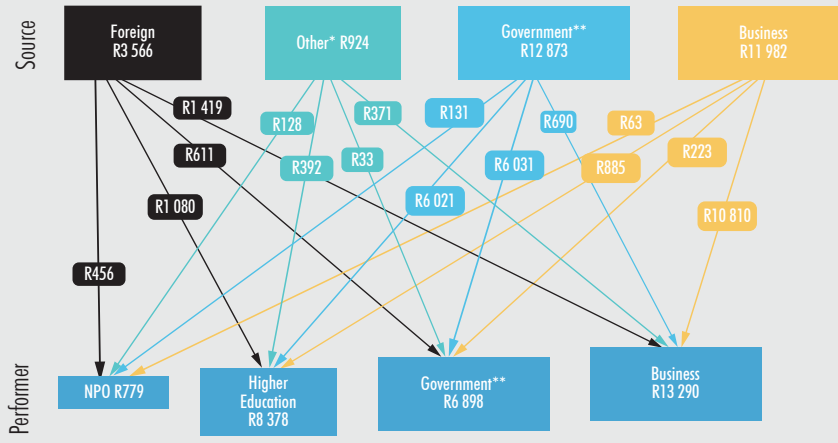
3. FUNDING FOR R&D

3.1 Major flows of R&D funding

Government funded the largest proportion of R&D in South Africa in 2014/15. The funding increased by 17.0% from R11.007 billion in 2013/14 to R12.873 billion in 2014/15, representing 43.9% of total R&D funding. Of these, the government institutions and higher education each received 46.8% (R6.031 billion and R6.021 billion respectively) of the total government R&D funding. The business and not-for-profit sectors were the smallest recipients of R&D funding from government, receiving 5.4% (R690 million) and 1.0% (R131 million) respectively. The business sector was the second-largest funder of R&D, contributing 40.8% (R11.982 billion) towards total R&D funding. The main source of funding for business R&D remains business itself. Business R&D expenditure financed by industry, that is own and other business funds, constituted 90.2% of R11.982 million. The remainder of this funding was allocated mainly to the higher education and government sectors at R885 and R223 million respectively.

The third-largest source of funding for R&D in 2014/15 was from abroad, amounting to 12.2% (R3.566 billion), an increase of 7.6% from R3.315 billion in 2013/14.

Figure 4: Major flows of funding, (R million), South Africa, 2014/15



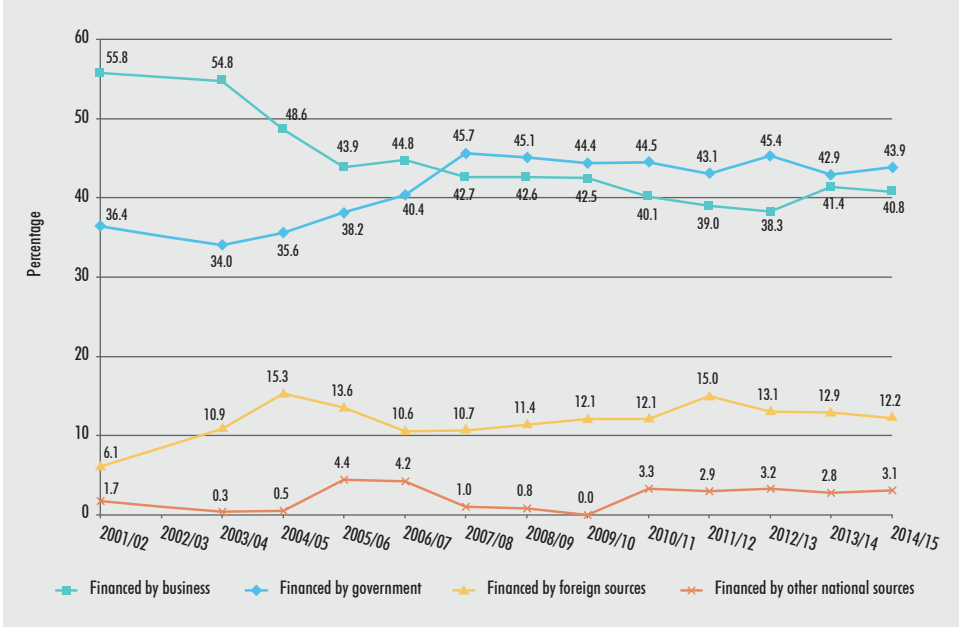
Data note	*Other national sources include contributions from higher education, not-for-profit organisations and individual donations. **Government includes science councils.
Data source	National Survey of Research and Experimental Development, 2014/15

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 government and other national sources increased in 2014/15, while the proportion of funds from business and foreign sources decreased.

Government-funded R&D increased from 42.9% of total funding in 2013/14 to 43.9% in 2014/15. The proportion of GERD from other national sources (see data note, figure 4) increased from 2.8% in 2013/14 to 3.1% in 2014/15. The proportion of business-funded R&D decreased from 41.4% in 2013/14 to 40.8% in 2014/15. Foreign funding decreased steadily from 15.0% in 2011/12 to 12.2% in 2014/15.

Figure 5: GERD by source of funds (percentage), South Africa, 2001/02 to 2014/15



Data note	*Other national sources include contributions from higher education, not-for-profit organisations and individual donations. **Government includes science councils.
Data source	National Survey of Research and Experimental Development, 2001/02 to 2014/15

3.3 Business-funded R&D

The business sector continued to fund its own research almost exclusively, funding 90.2% of its own R&D expenses in 2014/15. The funding of BERD by industry increased steadily between 2010/11 and 2014/15 but its total contribution to funding of GERD declined by 0.6%.

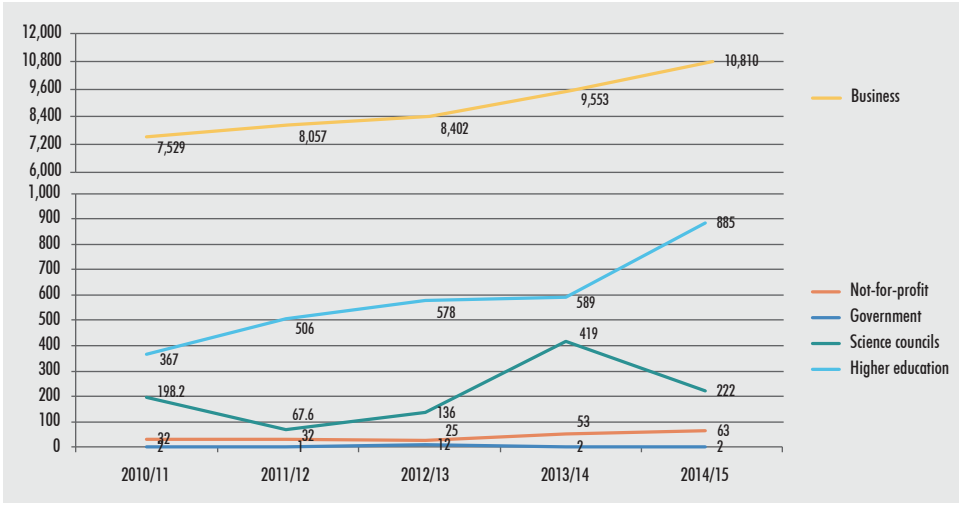
The higher education sector was the second-largest recipient of funding from the business sector, with the investment increasing by 50.3% from R589 million in 2013/14 to R885 million in 2014/15. Similarly, business funding of R&D in the not-for-profit sector increased from R53 million in 2013/14 to R63 million in 2014/15. Government sector R&D financed by the business enterprises declined remarkably from R1.75 million in 2013/14 to R290 000 in 2014/15 (Table 2, Figure 6). This also the case with the science councils where funding from industry decreased from R419 million (4.0%) in 2013/14 to R223 million (1.9%) in 2014/15 (Table 2).

Table 2: Business-funded R&D by sector of performance (R '000), South Africa, 2010/11 to 2014/15

SECTOR	2010/11	2011/12	2012/13	2013/14	2014/15
Business	7 528 667	8 056 545	8 402 340	9 552 717	10 810 428
Not-for-profit	31 627	32 081	24 894	53 359	63 084
Government	2 406	1 355	11 552	1 759	290
Science councils	198 206	67 614	135 729	419 469	222 892
Higher education	367 340	505 510	577 527	588 598	885 280
Total (current Rand value)	8 128 246	8 663 105	9 152 042	10 615 902	11 981 974
Total (constant 2010 Rand value)	8 128 246	8 122 796	8 132 931	8 901 003	9 495 336

Data note	*GDP deflator values derived from the Stats SA GDP: P0441, 4th Quarter 2014 and were used to calculate constant 2010 Rand values for R&D expenditure. Revised GDP (current values) Stats SA, GDP, 4th Quarter 2015, P0441
Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15

Figure 6: Business-funded R&D by sector of performance (R '000), South Africa, 2010/11 to 2014/15



Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15

3.4. Government funding of local R&D

Government funding of R&D continued to grow steadily and in a sustainable manner over the past 5 years. Higher education institutions and science councils were the largest recipients of funding from government in 2014/15. Government-funded R&D to higher education increased by 12.1% from R5.369 billion in 2013/14 to R6.020 billion in 2014/15. Similarly, funding to science councils increased by 26.6% from R3.412 billion to R4.319 billion in the same period. Government funding of R&D to the government sector increased by 19.2% from R1.436 billion in 2013/14 to R1.712 billion in 2014/15. The business sector received R&D funding of R690 million from government in 2014/15, while not-for-profit organisations received R131 million over the same period.

Table 3: Government-funded R&D (R'000), South Africa, 2010/11 to 2014/15

SECTOR	2010/11	2011/12	2012/13	2013/14	2014/15
Business	832 173	499 298	683 669	685 670	690 396
Not-for-profit	41 830	40 992	114 461	103 148	131 288
Government	990 290	1 112 307	1 269 337	1 436 141	1 711 809
Science councils	2 932 489	3 310 894	3 368 555	3 412 790	4 319 393
Higher education	4 222 092	4 598 426	5 395 871	5 369 334	6 020 572
Total (current Rand value)	9 018 874	9 561 917	10 831 893	11 007 083	12 873 458
Total (constant 2010 Rand value)	9 018 874	8 965 550	9 625 725	9 228 993	10 201 808

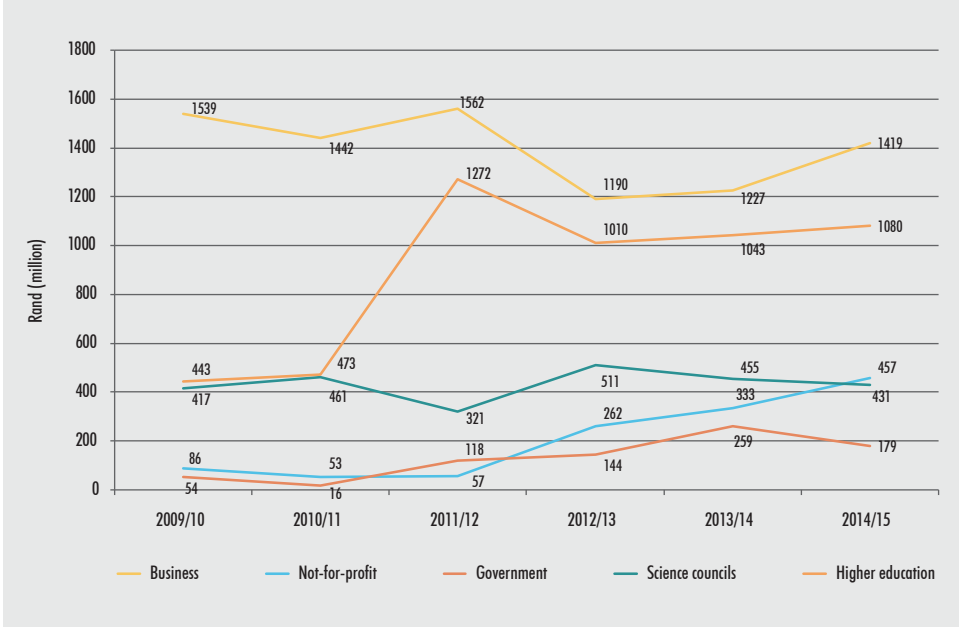
Data note	*GDP deflator values derived from the Stats SA, GDP, 4th Quarter 2015, P0441 release, and were used to calculate constant 2010 Rand values for R&D expenditure. Revised GDP (current values) Stats SA, GDP, 4th Quarter 2015, P0441
Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15

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 (39.8%) and higher education sectors (30.3%). Foreign funding of R&D for the business sector increased from R1.227 billion in 2013/14 to R1.419 billion in 2014/15, and increased marginally from R1.043 billion to R1.080 billion in the higher education sector over the same period. Not-for-profit organisations continued to show an increase in foreign-funded R&D, increasing by 37.2% from R333 million in 2013/14 to R457 million in 2014/15.

The science councils and government sector were the only sectors to experience a decrease in foreign funding. Science councils foreign-funded R&D decreased from R455 million in 2013/14 to R431 million in 2014/15, while funding for government decreased from R259 million to R179 million over the same period.

Figure 7: Foreign-funded R&D by sector of performance (R million), South Africa, 2010/11 to 2014/15



Data note	Foreign sources include all funding from foreign sources from all sectors.
Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15

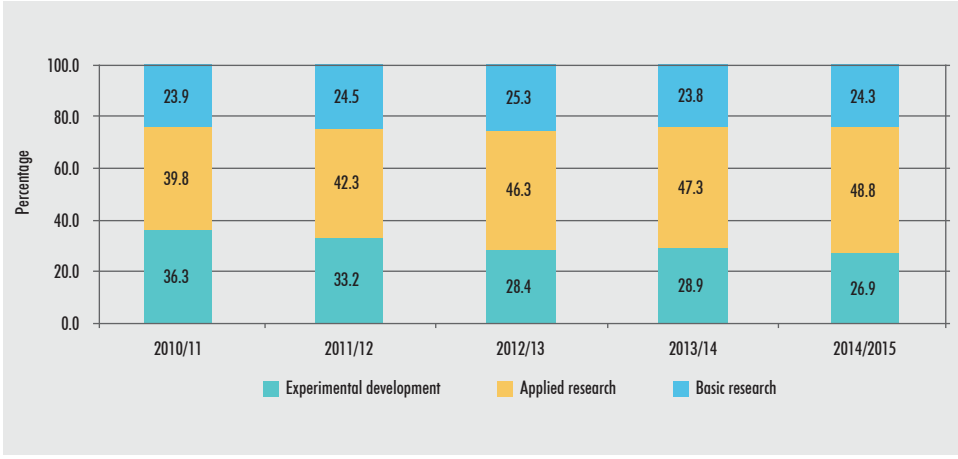
4. CATEGORIES OF GERD

4.1 GERD by type of research

The largest proportion of R&D expenditure continued to be devoted to applied research in the 2014/15 R&D survey period, accounting for 48.8% of GERD. This is an increase on the value of 47.3% recorded in the 2013/14 reporting period. There was, however, a decrease in the share of expenditure on experimental development, from 28.9% in 2013/14 to 26.9% in the current period, while basic research activity recorded a slight increase from 23.8% in 2013/14 to 24.3% in 2014/15.

The increase in expenditure on applied research continued across the five-year period from 2010/11 to 2014/15, despite a lower rate of increase between 2012/13 and 2014/15. Changes in the patterns of R&D expenditure between 2010/11 and 2014/15 indicate an increase of 9.0% in applied research, while the share of expenditure on basic research declined by 0.4%, and experimental development by 9.4% over this period.

Figure 8: GERD by type of research (percentage), South Africa, 2010/11 to 2014/15



Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15

4.2 GERD by type of research and sector of performance

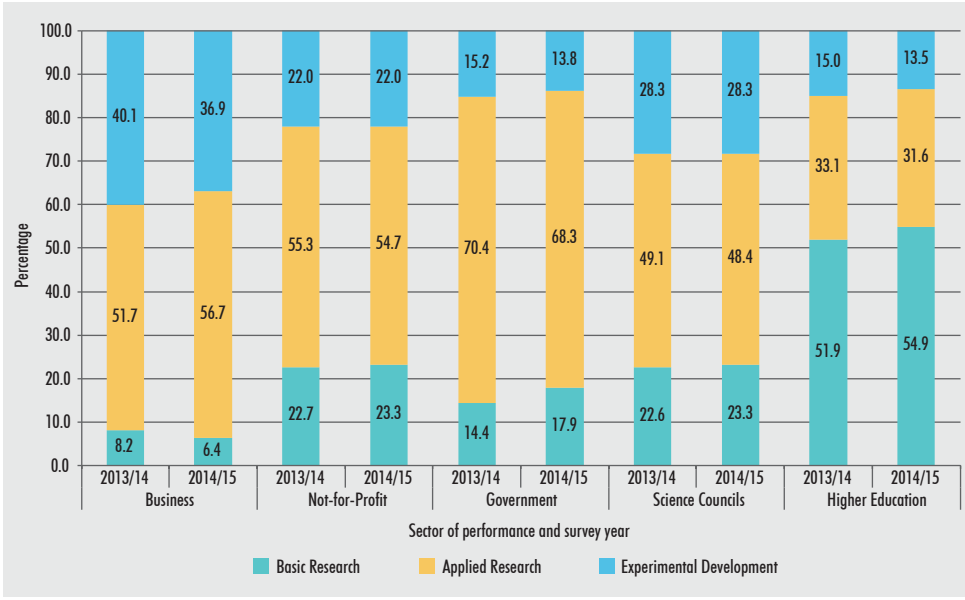
Expenditure on basic research decreased by 1.8% from 8.2% in 2013/14 to 6.4% in 2014/15, while experimental development accounted for 36.9% of BERD in 2014/15 compared to 40.1% in 2013/14. Expenditure on applied research in the business sector increased by five percentage points, from 51.7% in 2013/14 to 56.7% in 2014/15. The trend shows that the business sector as predominantly conducting experimental development research until the 2010/11 survey cycle. This is the third consecutive year where the expenditure in applied research is higher than expenditure in experimental research. The not-for-profit sector recorded minimal year-on-year changes in the type of R&D reported. The expenditure in experimental development research remained relatively unchanged at 22.0% for few years. Similarly, there was a minor decrease in the percentage of expenditure reported on applied research from 55.3% to 54.7%, while the percentage of expenditure on basic research remained similar between 2013/14 at 22.7% and 23.3% in 2014/15. 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 2014/15 and the real growth in investment.

Despite minor decreases, the government sector remained the largest performer of applied research in the 2014/15 reference period. Expenditure on applied research decreased in share of expenditure from 70.4% in 2013/14 to 68.3% in 2014/15.

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, demonstrating an increase in this type of R&D expenditure from 51.9% in 2013/14 to 54.9% in 2014/15.

The science council sector remained relatively stable across the two reference periods, with minimal increases in basic research expenditure, and similarly small decreases in applied research expenditure.

Figure 9: GERD by type of research and sector of performance (percentage), South Africa, 2013/14 to 2014/15



Data source	National Survey of Research and Experimental Development, 2013/14 to 2014/15

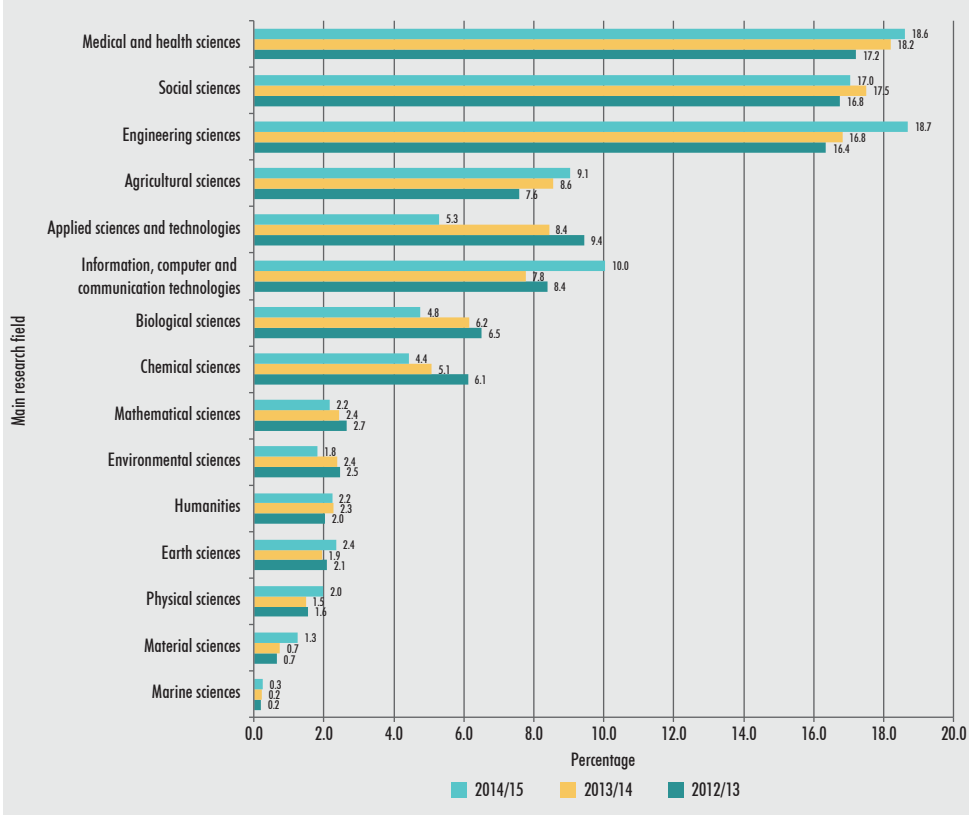
4.3 GERD by major research field

Engineering and medical and health sciences accounted for the largest share of GERD, attracting 18.7% and 18.6% respectively of total R&D expenditure.

As in the 2013/14 survey period, the social sciences continued to attract a growing share of GERD, with 17.0% of expenditure recorded in this research field, representing a slight decrease of 0.5% over the period. The share of total GERD spent on the agricultural sciences increased from 8.6% in 2013/14 to reach 9.1% in 2014/15. There was a decrease in the expenditure related to the applied sciences and technologies sector, decreasing from 8.4% in 2013/14 to 5.3% in the 2014/15 reference period.

Expenditure on information, computer and communication technologies revealed an increase, from 7.8% in 2013/14 to 10.0% in 2014/15. The humanities recorded a minor decrease in the overall proportion of GERD, from 2.3% in 2013/14 to 2.2% in 2014/15.

Figure 10: GERD by research field (percentage), South Africa, 2012/13 to 2014/15



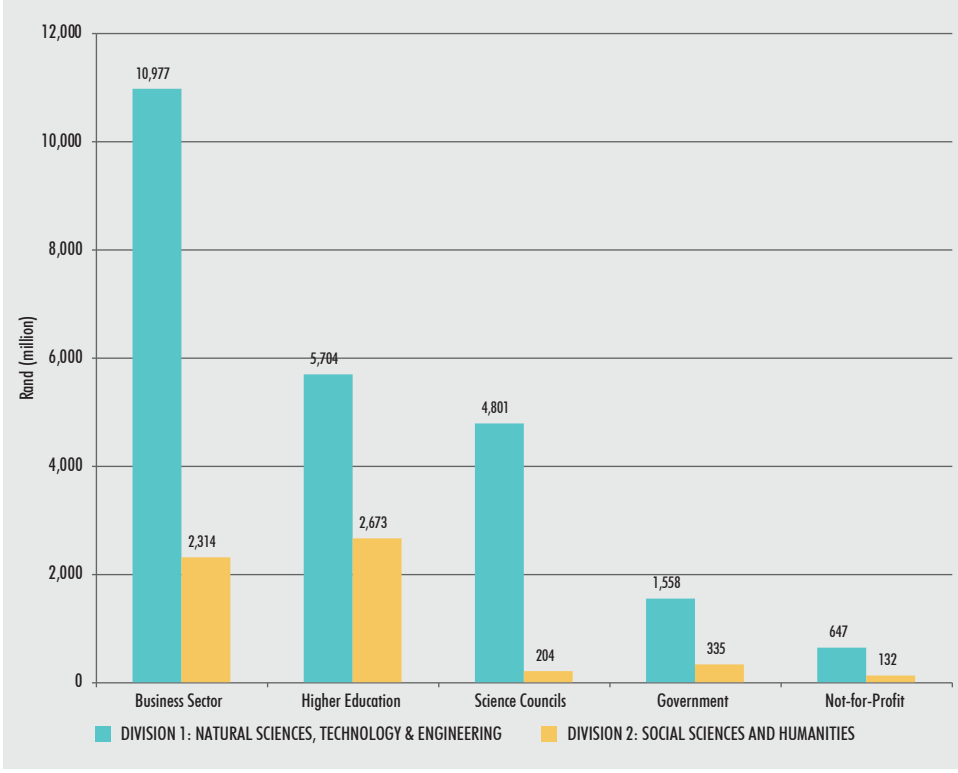
Data note	GERD according to research fields as measured in the R&D survey.
Data source	National Survey of Research and Experimental Development, 2012/13 to 2014/15

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 80.7% of GERD, while Division 2 attracted 19.2% of overall R&D expenditure in 2014/15.

The business sector continued as the largest performer of Division 1 research activities, spending R10.97 billion in 2014/15. The higher education sector accounted for the largest proportion of R&D expenditure on the social sciences and humanities, totalling R2.67 billion in 2014/15. R&D in the social sciences and humanities increased from R5.07 billion in 2013/14, to R5.66 billion in 2014/15, mostly through inputs from the business and higher education sectors.

Figure 11: R&D expenditure by research field (R million), South Africa, 2014/15



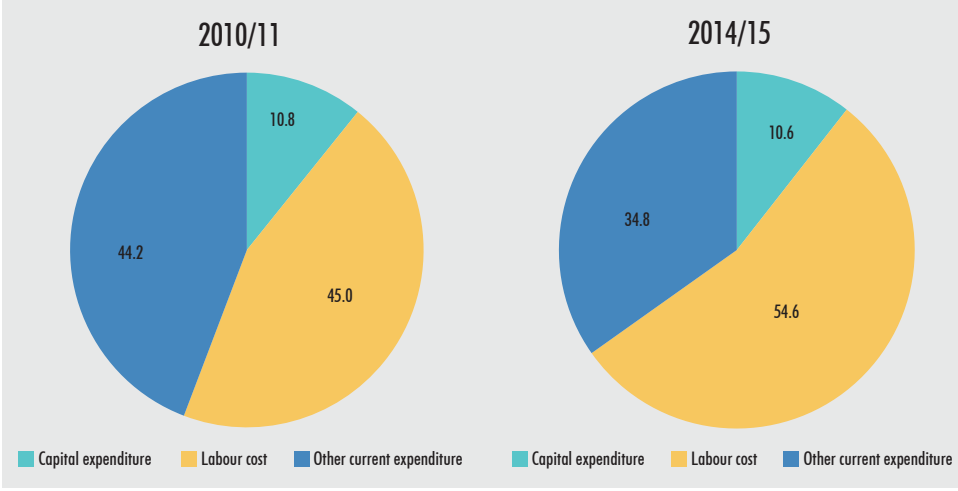
Data note	Research field codes are used to classify research expenditure into two divisions according to defined scientific disciplines: Division 1 (Natural sciences, technology and engineering) and Division 2 (Social sciences and humanities).
Data source	National Survey of Research and Experimental Development, 2014/15

4.5 R&D expenditure by accounting category

The proportion of R&D allocated to labour costs continued to increase, from 41.2% in 2010/11 to 49.2% in 2014/15. This trend over the five-year period was driven primarily within the public sector (higher education, science councils and government), however increases in labour costs in the business and not-for-profit sectors influenced this outcome to a lesser extent.

The percentage of R&D expenditure allocated to other current expenditure decreased substantially from 44.2% in 2010/11 to 34.8% in 2014/15, while expenditure on capital items displayed a minor decrease, from 10.8% in 2010/11 to 10.6% in 2014/15.

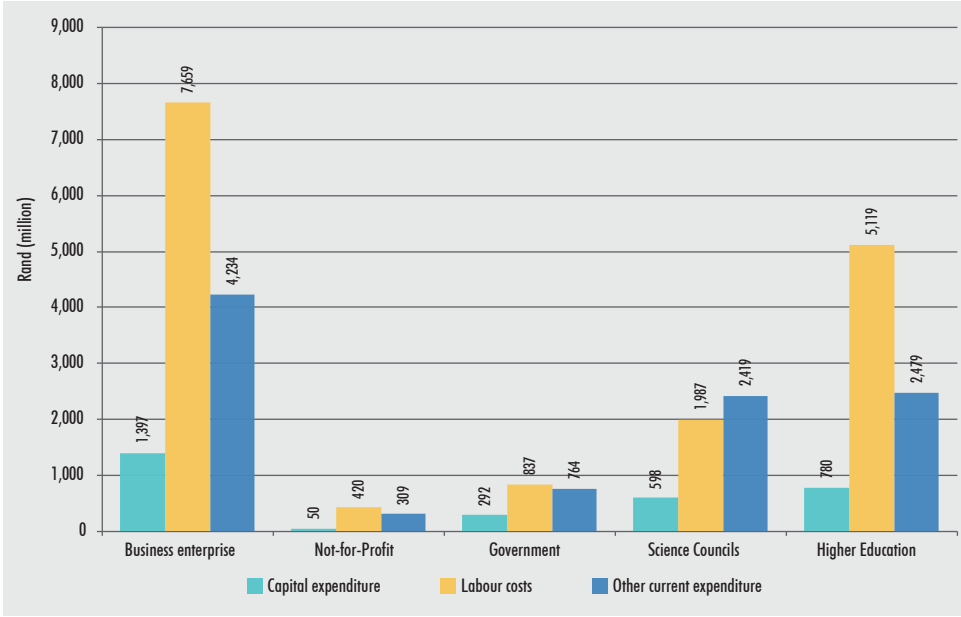
Figure 12: R&D expenditure by accounting category (percentage), South Africa, 2010/11 and 2014/15



Data note	Labour costs includes the postgraduate student costs of 18.8%.
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, 2010/11 and 2014/15

Labour costs continued to account for the bulk of R&D expenditure across the five sectors in 2014/15. In the business sector, labour costs accounted for 57.6% of total BERD (R7.66 billion), while in the higher education sector, labour costs accounted for 61.1% (R5.12 billion) of sector R&D expenditure, the highest proportion across the five sectors.

Figure 13: R&D expenditure by accounting category (R million), South Africa, 2014/15



Data source	National Survey of Research and Experimental Development R&D, 2014/15

4.6 Business sector R&D expenditure by Standard Industrial Classification

The Standard Industrial Classification (SIC) system 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 has collectively been the largest contributor to BERD. In 2013/14, R&D spending in the financial, intermediation, real estate and business services amounted to R4.72 billion (40.1% of total BERD). This was followed by manufacturing, which spent R 3.79 billion (32.2% of BERD).

Compared to the 2013/14 survey period, the sub-sectors represented in the SIC 80 000 group (financial, intermediation, real estate and business services) reported an increased share of GERD expenditure, with financial intermediation, except insurance and pension funding (SIC 81000), accounting for 12.6% of BERD in 2014/15 compared to 4.2% in 2013/14 (Figure 14). By comparison, SIC code 88000 (other business activities) recorded a large decrease in expenditure, from R1.650 billion in 2013/14 to R0.585 billion in 2014/15.

R&D in the manufacturing sector continued to show a year-on-year increase, from R3.79 billion in 2013/14 to R4.50 billion in 2014/15 (Figure 15). The share of BERD accounted for in the manufacturing sector overall continued to decline across the five-year period. The manufacturing sector showed some growth in 2014/15, particularly in the manufacture of refined petroleum, coke and nuclear fuel code group (SIC 33 000), where R&D increased by 3.2% over the level recorded

in 2013/14. The manufacture of basic metals (SIC 35000) and transport equipment (SIC 38 000) showed a slight decrease in share of BERD reported in the manufacturing sector for 2014/15.

Mining and quarrying remained the third-largest contributor to BERD, attracting an expenditure value of R1.34 billion, but this represents a year-on-year decrease of 20.0%. The agriculture, hunting, forestry and fishing sector showed growth in the 2014/15 survey, with an increase in expenditure of 26.4%, from R364 million in 2013/14 to R460 million in 2014/15.

The wholesale and retail sector recorded a decrease in R&D expenditure in 2014/15, reporting R14.65 million less R&D than in 2013/14. The construction sector remained a very small R&D contributor, accounting for less than 0.1% of BERD in 2014/15 and reporting 17.4% less R&D expenditure in 2014/15 than in 2013/14.

Figure 14: Business R&D expenditure by SIC category (as a percentage of GERD), South Africa, 2013/14 and 2014/15

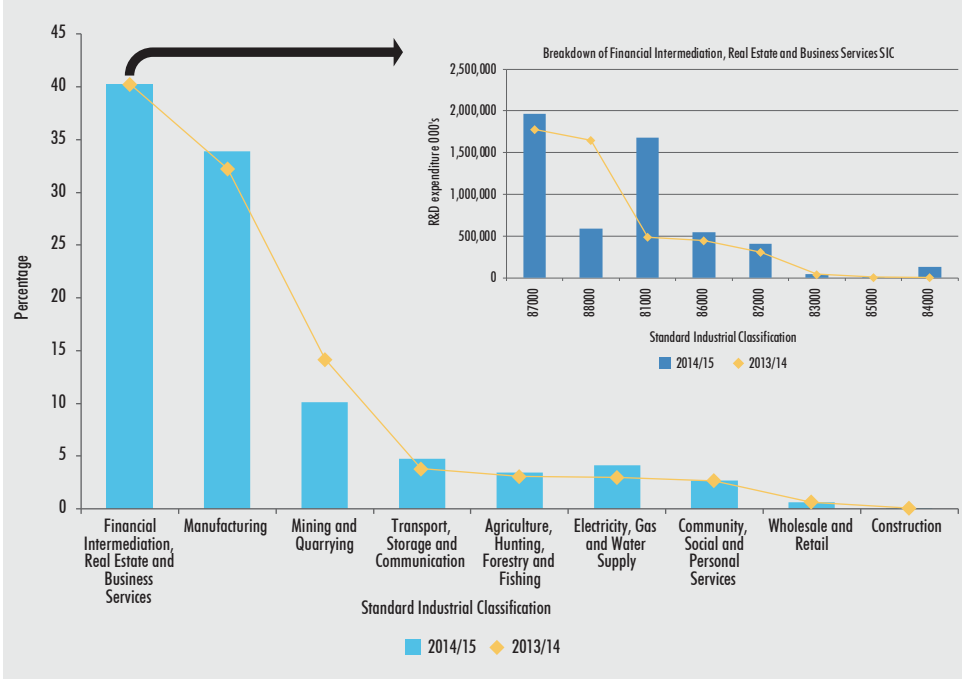


Table 4: Standard Industrial Classification (SIC) categories in the 80000 group

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 Stats SA'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, 2013/14 and 2014/15

Figure 15: Business R&D expenditure by SIC manufacturing category, South Africa, 2013/14 and 2014/15

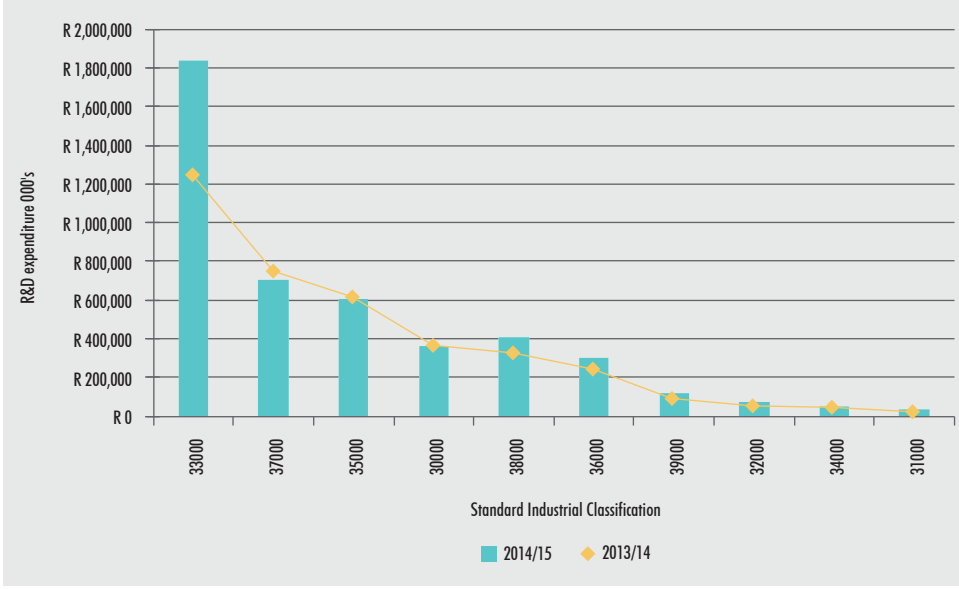


Table 5: Standard Industrial Classification (SIC) codes in the 30000 group

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

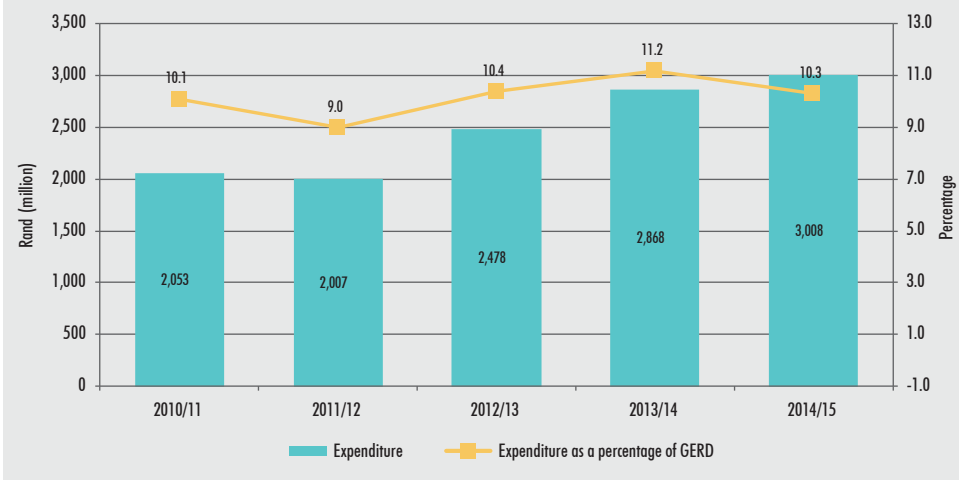
Definition	Industry classification is based on Statistics South Africa's five-digit Standard Industrial Classification (SIC) codes, which are used to classify businesses according to their economic activities.
Data source	National Survey of Research and Experimental Development, 2013/14 and 2014/15

4.7 R&D related to HIV/AIDS, malaria and tuberculosis and biotechnology R&D

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

R&D expenditure in priority health areas, including tuberculosis (TB), HIV/AIDS and malaria, increased by R140 million, from R2.87 billion in 2013/14 to R3.01 billion in 2014/15 (Figure 16). R&D expenditure on TB, HIV/AIDS and malaria in 2014/15 was at its highest in the five-year period since 2010/11. Expenditure increased by 46.8% over this period, from R 2.05 billion in 2010/11 to R 3.00 billion in 2014/15.

Figure 16: R&D expenditure on TB, HIV/AIDS and malaria (R million and as a percentage of GERD), South Africa, 2010/11 to 2014/15

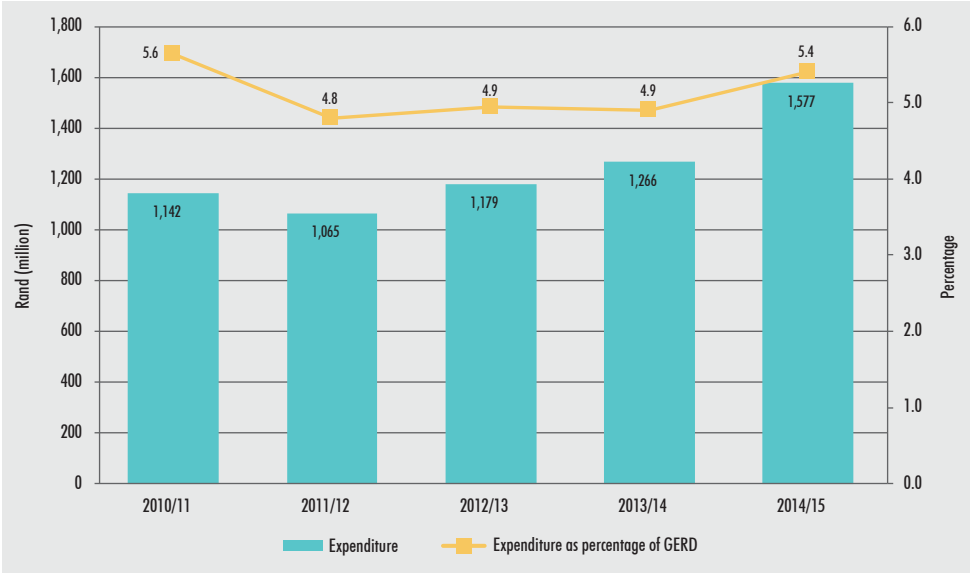


Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15

4.7.2 Biotechnology-related R&D

Expenditure on biotechnology-related R&D amounted to R1.57 billion in 2014/15, representing a nominal increase of R 310.402 million compared with the values reported in the 2013/14 R&D survey of R1.27 billion (Figure 17). This value as a percentage of GERD increased from 4.9% in 2013/14 to 5.4% in 2014/15.

Figure 17: R&D expenditure on biotechnology (R million and as a percentage of GERD), South Africa, 2010/11 to 2014/15



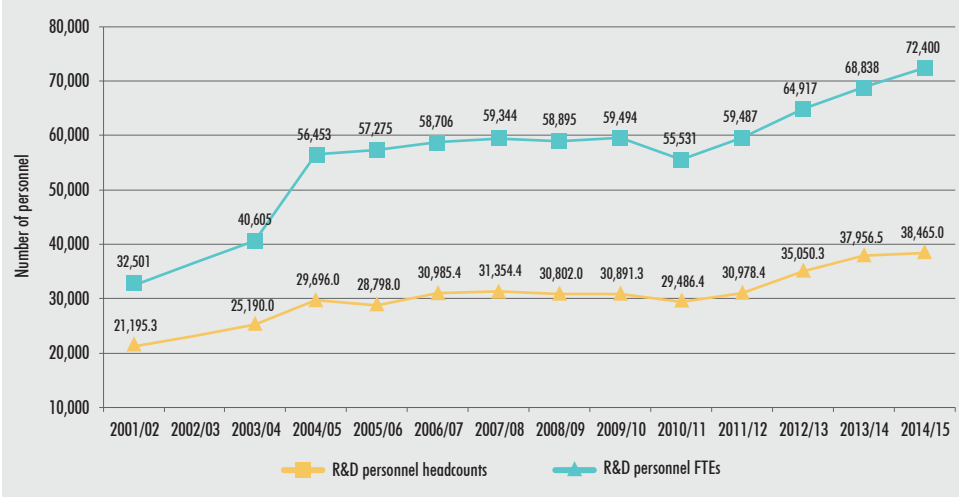
Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15

5. PEOPLE IN R&D

5.1 R&D personnel

The 2014/15 R&D survey recorded 72 400 R&D personnel (headcount), an increase of 3 562 from 2013/14. 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 2014/15 (Figure 18). The increase in R&D personnel FTEs was attributed to an increase in the number of researchers, mainly at the level of postgraduate students in higher education.

Figure 18: R&D Personnel (headcount and FTEs), South Africa, 2001/02 to 2014/15



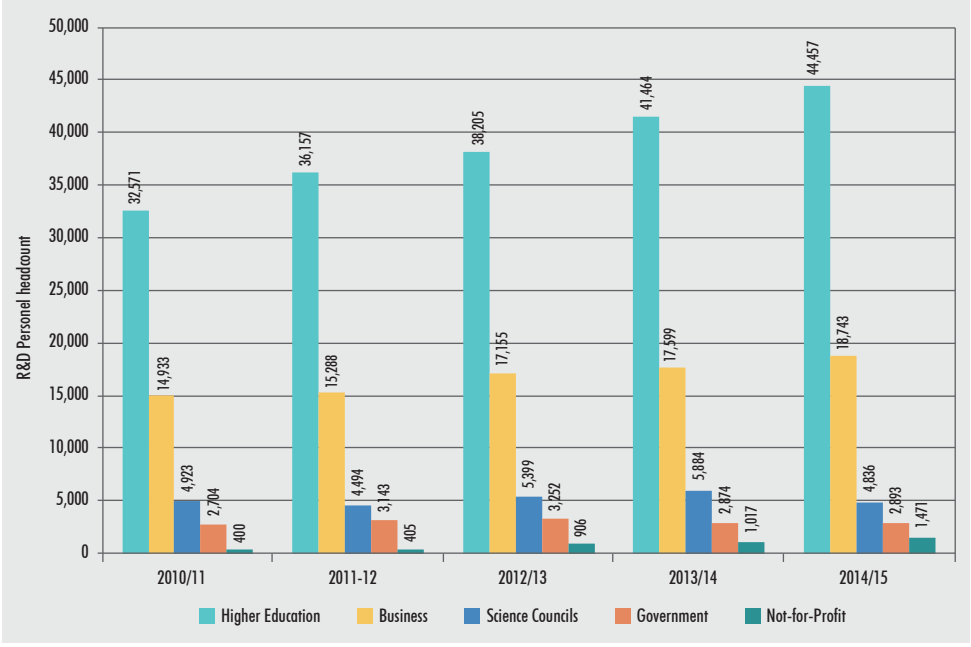
Data note	Following OECD practice, doctoral students and post-doctoral fellows are counted as researchers.
Data source	National Survey of Research and Experimental Development, 2001/02 to 2014/15.

5.1.1 R&D personnel headcount by sector of performance

In the 2014/15 R&D survey the majority of R&D personnel were employed in the higher education and business sectors, which recorded headcounts of 44 457 and 18 743 respectively. Increases in R&D personnel were recorded across all sectors except the science councils. The science councils reported a lower R&D personnel headcount of 4 836 in 2014/15 compared to the 5 884 in 2013/14. The reduction was found to be in the category of 'other personnel directly supporting R&D'. Fieldwork investigation revealed that certain science councils had previously misinterpreted the criteria used to count 'other personnel', and had over-reported personnel in this category.

The recorded headcount of R&D personnel in the not-for-profit sector increased from 1 017 in 2013/14 to 1 471 in 2014/15 owing to R&D entities with large numbers of R&D personnel participating in the survey for the first time. The government sector headcounts remained largely unchanged.

Figure 19: R&D Personnel by sector (headcount), South Africa, 2010/11 to 2014/15

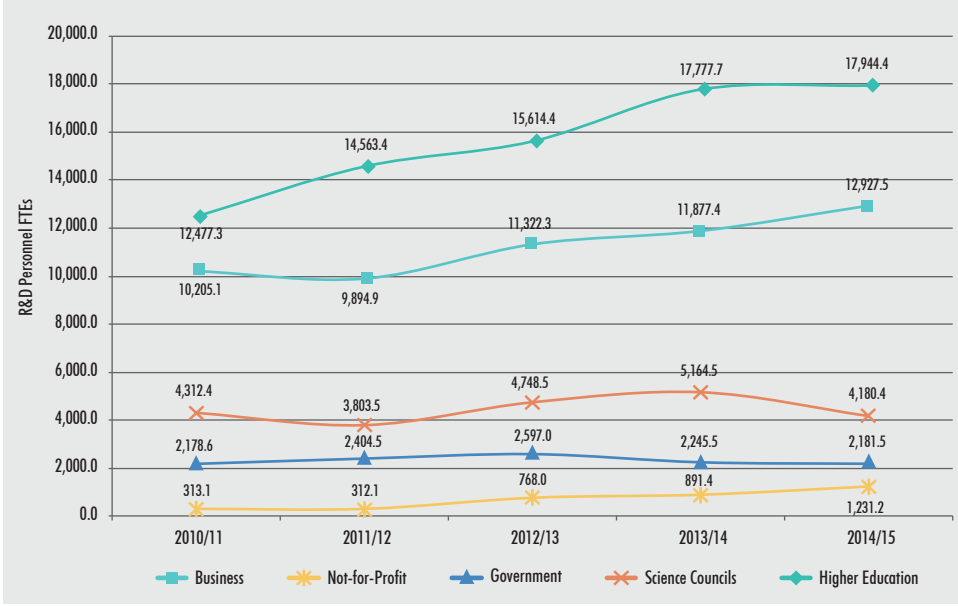


Data note	Higher education R&D personnel include post-doctoral fellows and doctoral students under the 'researcher' category.
Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15.

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

In the 2014/15 R&D survey, all sectors except government and science councils reported increases in FTE R&D personnel. The highest numbers of FTEs were in higher education (17 944.4) and the business sector (12 927.5). The 2014/15 survey recorded a 1.3% increase in FTEs for the total R&D personnel between 2013/14 and 2014/15, counter to the 8.3% recorded between 2012/13 and 2013/14.

Figure 20: R&D Personnel by sector (FTEs), South Africa, 2010/11 to 2014/15

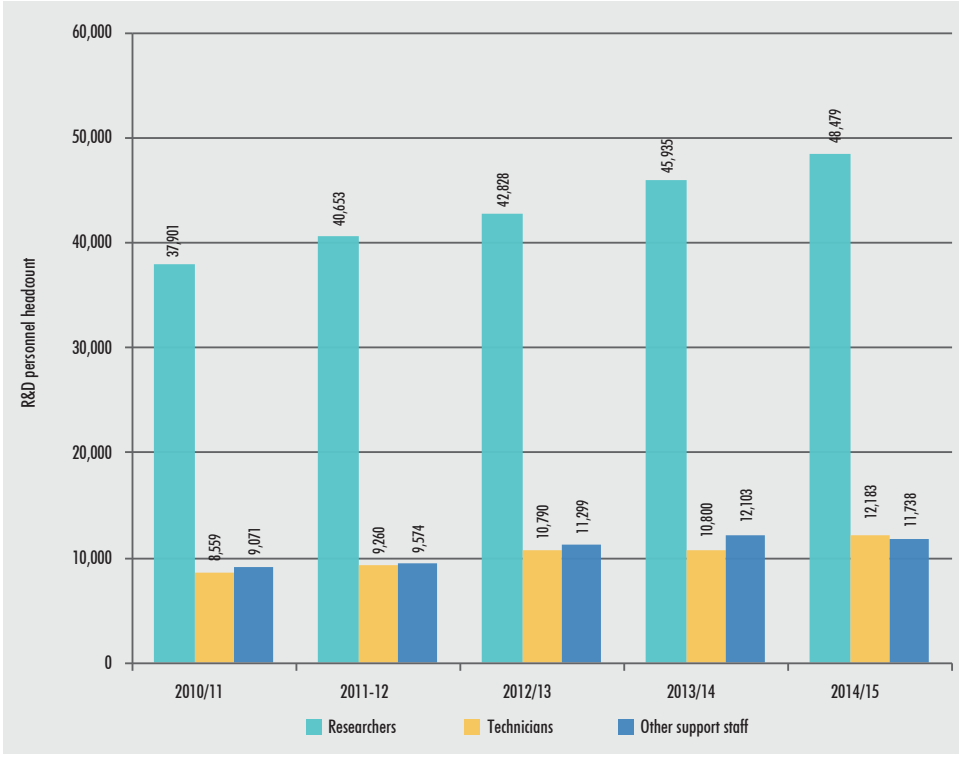


Data note	Following OECD practice, doctoral students and post-doctoral fellows are counted as researchers.
Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15.

5.1.3 R&D personnel by occupation

Researchers made up the highest number of R&D personnel, accounting for 67.0% of the total, followed by technicians at 16.8%, and other support staff directly supporting R&D at 16.2%. The headcount of researchers increased by 5.5% from 45 935 in 2013/14 to 48 479 in 2014/15. The headcount of technicians increased from 10 800 in 2013/14 to 12 183 in 2014/15, while the headcount of other support staff directly supporting R&D decreased from 12 103 to 11 738 to over the same period.

Figure 21: R&D Personnel by occupation (headcount), South Africa, 2010/11 to 2014/15



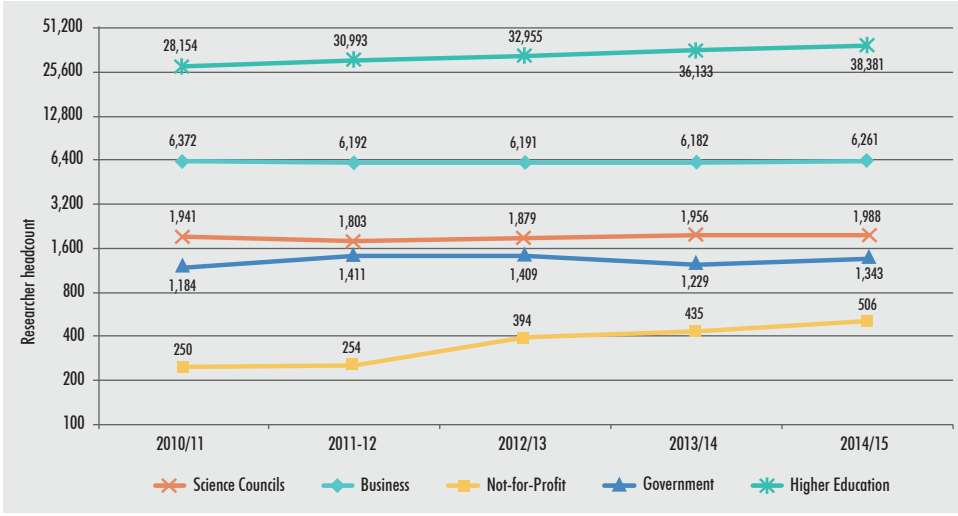
Data note	Higher education R&D personnel include post-doctoral fellows and doctoral students under the 'researcher' category.
Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15

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 38 381 in 2014/15, an increase of 6.2% between 2013/14 and 2014/15. Researcher headcounts increased by 16.3% in the not-for-profit sector between 2013/14 and 2014/15. The headcount of researchers in the government, science councils and business sectors remained fairly constant, showing minimal increases between 2010/11 and 2014/15 with the exception of the business sector that had a decrease.

Figure 22: Researchers by sector (headcount), South Africa, 2010/11 to 2014/15

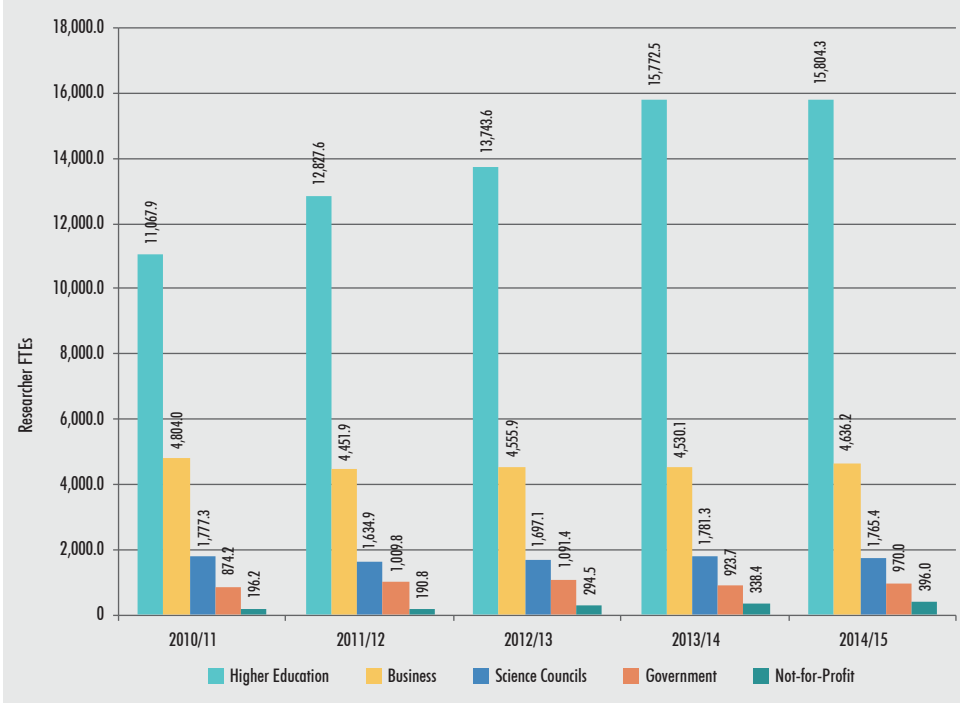


Data note	Higher education R&D personnel include post-doctoral fellows and doctoral students under the 'researcher' category.
Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15

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

In the higher education sector, the number of researcher FTEs shows steady increases over the five year period, growing from 11 067.9 in 2010/11 to 15 804.3 in 2014/15. These increases are largely driven by the growth of postgraduate students in the sector. The researcher FTEs in the business, science council and government sectors showed very little change, following similar trends to those observed for the corresponding researcher headcounts in the previous periods. The not-for-profit sector experienced a steady increase in researcher FTEs between 2010/11 and 2014/15, from 196.2 to 396.0 in 2014/15, and showed a 17.0% increase between 2013/14 and 2014/15. The growth was through general increases in the sector but also measurement-related.

Figure 23: Researchers by sector (FTEs), South Africa, 2010/11 to 2014/15

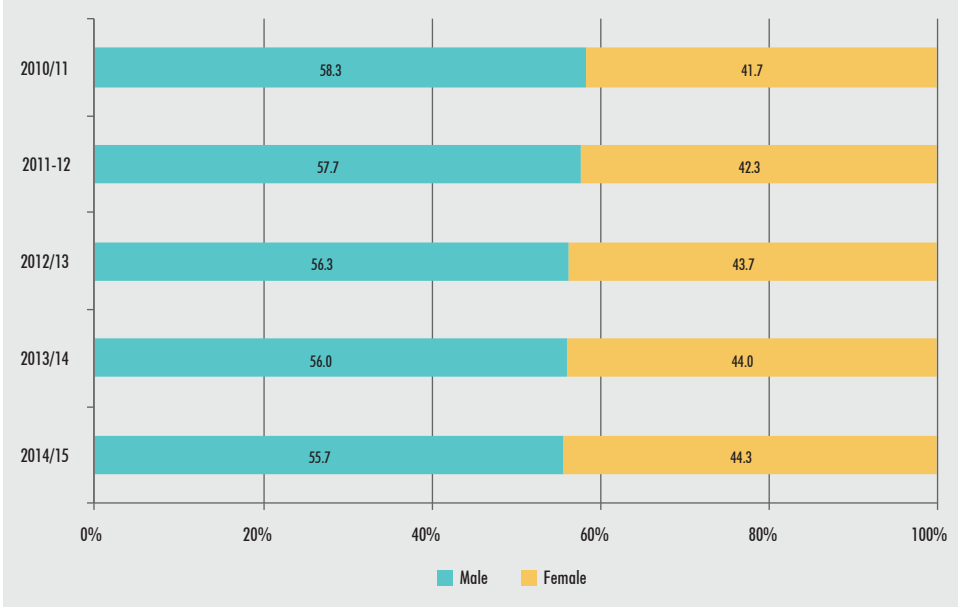


Data note	Higher education researchers include post-doctoral fellows and doctoral students under the 'researcher' category. Full-time equivalent (FTE) refers to the number of hours (in terms of person years of effort) spent on R&D activities.
Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15.

5.2.3 Researcher headcount by gender

The 2014/15 R&D survey recorded 55.7% of researchers as male and 44.3% 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 41.7% in 2010/11 to 44.3% in 2014/15. Between 2013/14 and 2014/15, employed female researchers increased by 3.0% and female postgraduate students increased by 10.8%.

Figure 24: Researchers by gender (percentage), South Africa, 2010/11 to 2014/15



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, 2010/11 to 2014/15

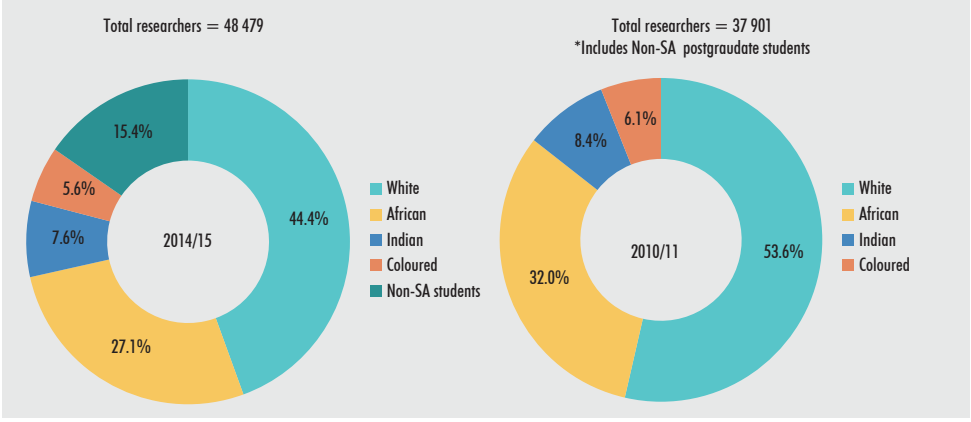
5.2.4 Researchers by population group

The majority of researchers in South Africa are from the White population group (Figure 25). This population group accounted for 44.4% of total researchers in 2014/15. Researchers from the other population groups (Africans, Coloureds and Indians), collectively, increased in proportion from 46.4% in 2010/11 to 55.6% in 2014/15.

The proportion of African researchers in 2014/15 was 27.1%, compared to 32.0% in 2010/11. 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 decreased from 6.1% in 2010/11 and remained constant at 5.6% in 2013/14 and 2014/15. The percentage of Indian researchers decreased from 8.4% to 7.6% over the same period. Non-South African students (post-doctoral fellows and doctoral students) accounted for 15.4% of researchers in 2014/15.

The researcher FTE per thousand employed decreased to 0.15. This indicator has been static over the years, which is due to the increase in researcher FTE which is not increasing at the same pace as the number employed.

Figure 25: Researchers by population group (percentage), South Africa, 2010/11 to 2014/15

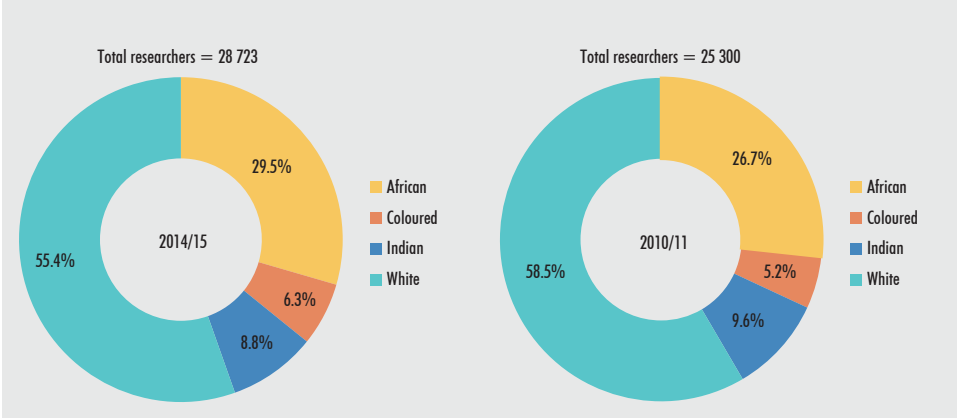


Data note	Higher education researchers include post-doctoral fellows and doctoral students under the 'researcher' category. Postgraduate student data were collected by non-SA and SA categories only from the 2011/12 survey onwards. The full set of data from 2011/12 until 2014/15 can be referred to in Table 6.
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, 2010/11 and 2014/15

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 2014/15 comprised 55.4% White researchers, 29.5% African researchers, 8.8% Indian researchers and 6.3% Coloured researchers (Figure 26). 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 26.7% in 2010/11 to 29.5% in 2014/15; Indian researchers decreased from 9.6% to 8.8%; and Coloured researchers increased from 5.2% to 6.3%. The percentage of White researchers decreased from 58.5% to 55.4% over the same period.

Figure 26: Researchers (excluding doctoral students and post-doctoral fellows) by population group (percentage), South Africa, 2010/11 to 2014/15



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, 2010/11 and 2014/15

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

In 2014/15, 29.5% of researchers (excluding doctoral students and post-doctoral fellows) were African, an improvement on the 26.7% African researchers recorded in 2010/11 (Figure 27). African researchers with a doctoral degree increased from 6.0% in 2010/11 to 7.6% in 2014/15. In 2014/15, White researchers accounted for the majority of those with a doctoral qualification (21.2%). The majority of South African researchers held masters, honours, bachelor or equivalent degree, from 2010/11 to 2014/15.

Figure 27: Researchers (excluding doctoral students and post-doctoral fellows) by qualification and population group (percentage), South Africa, 2014/15

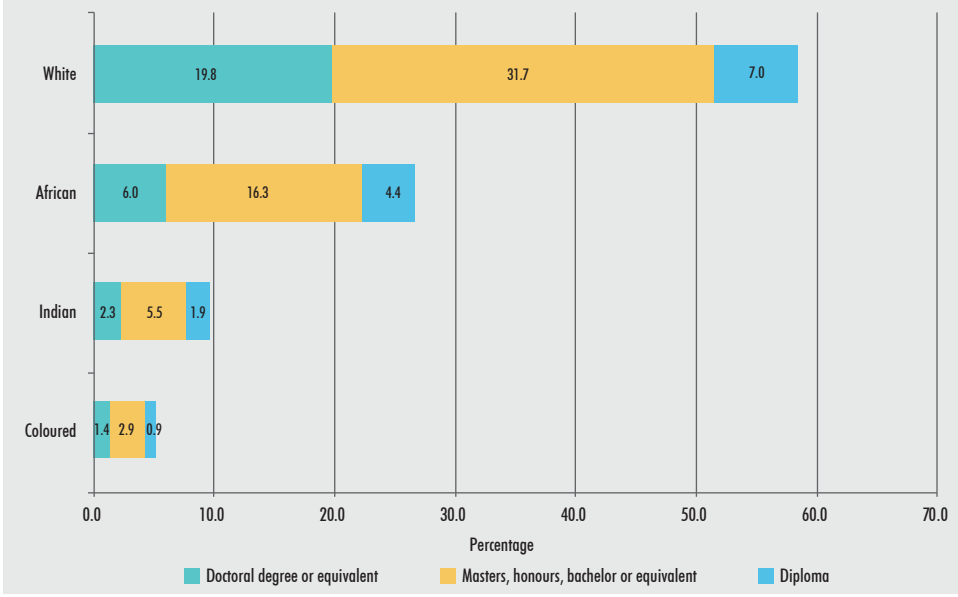
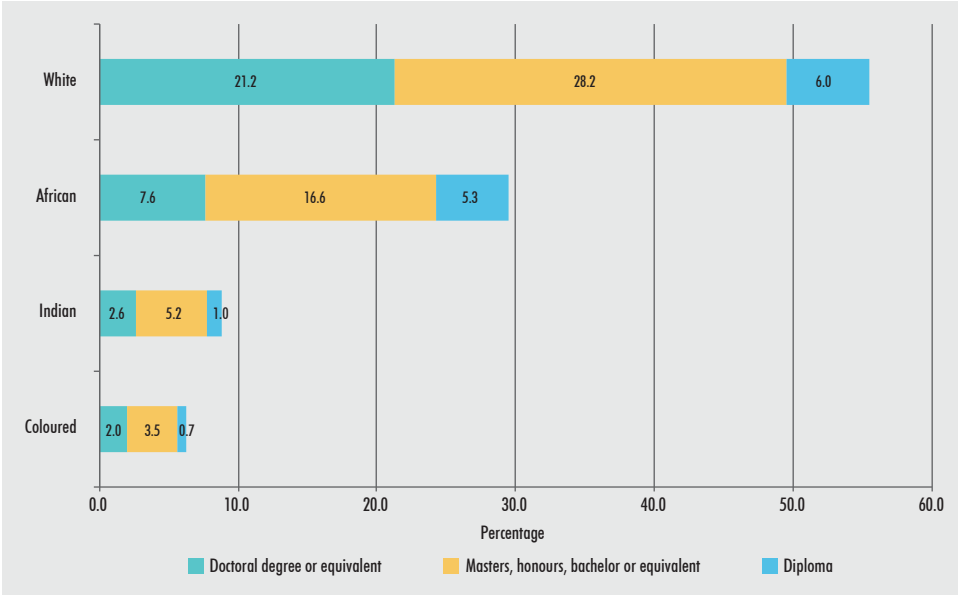


Figure 28: Researchers (excluding doctoral students and post-doctoral fellows) by qualification and population group (percentage), South Africa, 2010/11



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, 2010/11 and 2014/15

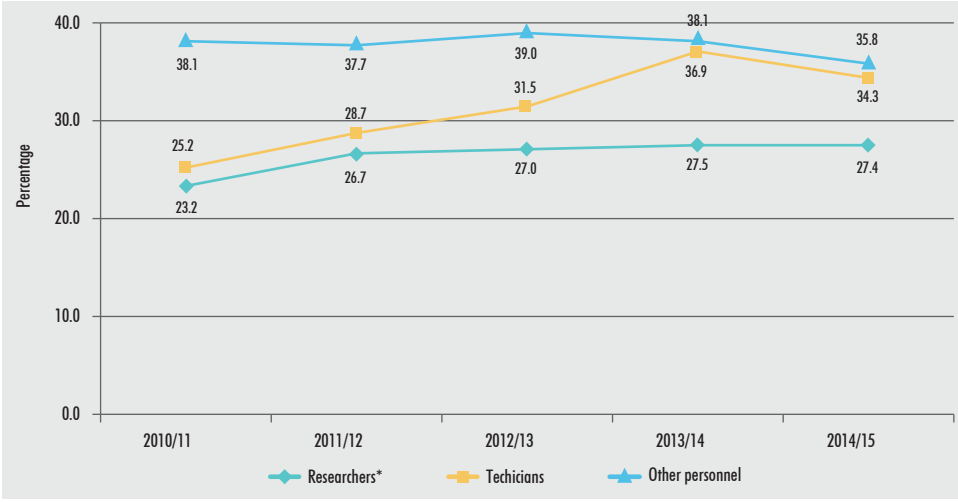
5.3 Higher education R&D personnel

5.3.1 Higher education R&D personnel: FTEs as a percentage of headcount

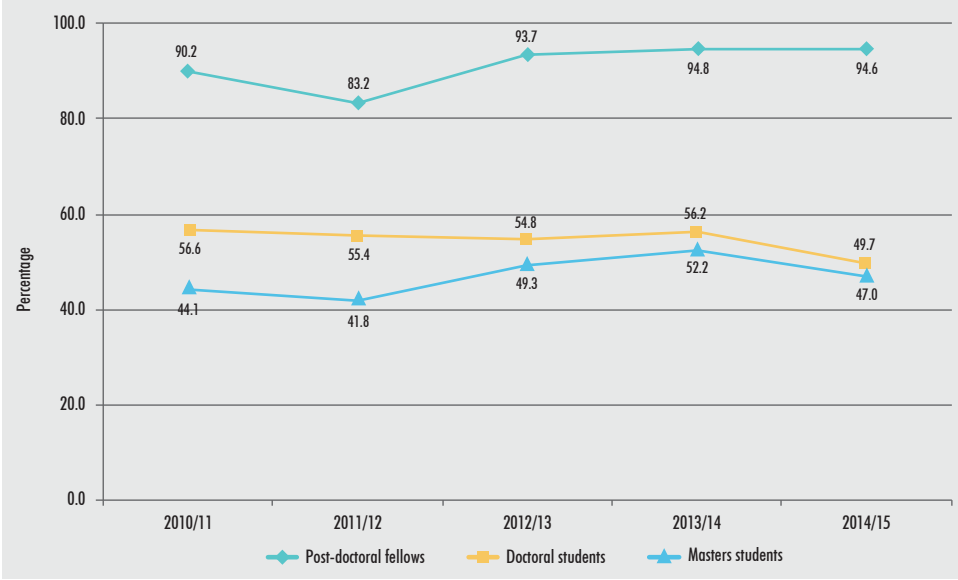
The 2014/15 R&D survey data reflected increases in headcounts and FTEs in both the R&D personnel and researcher categories. Higher education researchers (excluding post-doctoral fellows and postgraduate students) spent 23.2% of their time on research in 2010/11, and this percentage increased to 27.4% in 2014/15. Doctoral students spent 56.6% of their time on research activities in 2010/11 and 49.7% in 2014/15, while masters students spent 44.1% of their time on research in 2010/11 and 47.0% in 2014/15. 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 90.2% in 2010/11 to 83.2% in 2011/12, but this percentage improved to 94.6% in 2014/15.

Figure 29: Higher education R&D personnel and students (FTEs as a percentage of headcount), South Africa, 2010/11 to 2014/15

Higher education R&D personnel FTE as a percentage of headcount (excluding postdoctoral fellows and postgraduate students)



Higher education post-doctoral fellows and postgraduate students FTE as a percentage of headcount

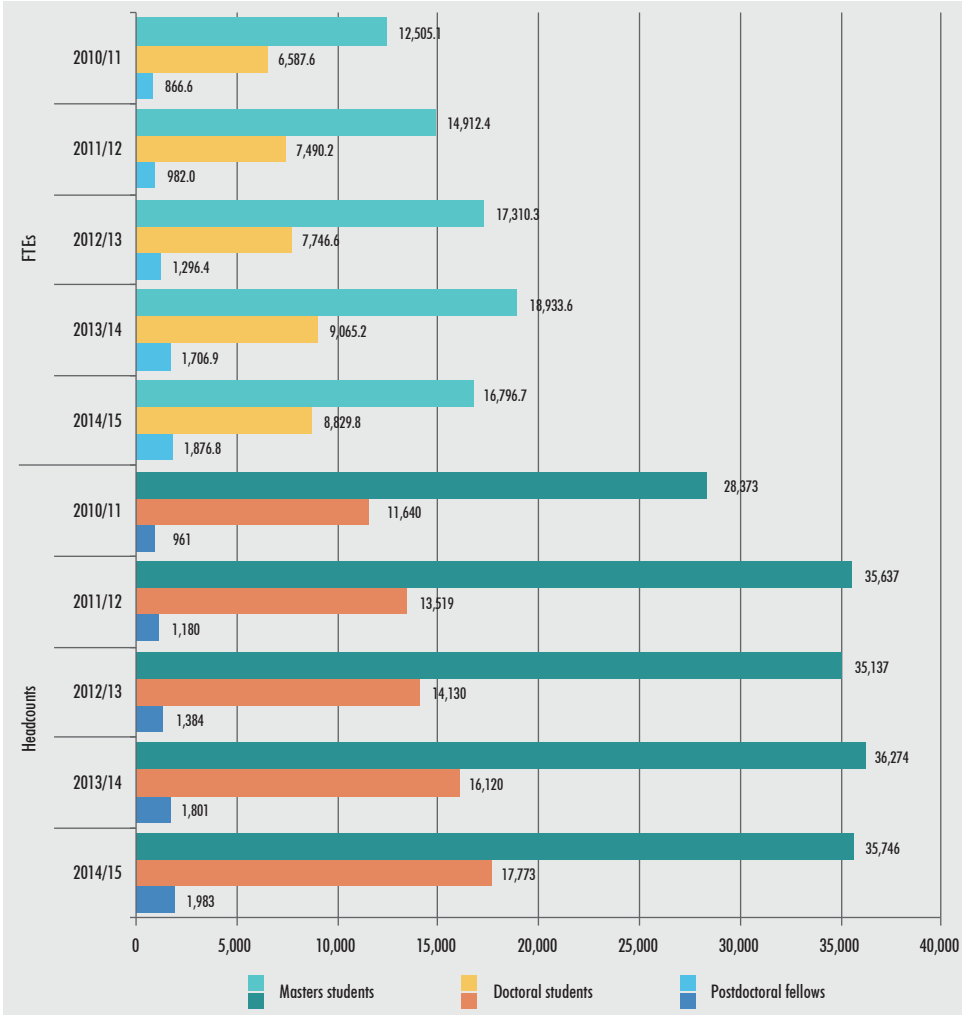


Data note	FTEs as a percentage of headcount. The 2014/15 survey captured data on doctoral students and post-doctoral fellows according to race, gender and whether they were South African nationals or not.
Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15

5.3.2 Post-doctoral fellow and post-graduate student headcount 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 2010/11 and 2013/14. The headcount of doctoral students was 11 640 in 2010/11 and reached 17 773 in 2014/15. The headcount of masters students increased from 28 373 in 2010/11 to 35 746 in 2014/15. The masters student FTEs showed a decrease of 2 136.9 from 2013/14 to 2014/15 due to inconsistency in methodology used by institutions when reporting masters student headcounts and FTEs.

Figure 30: Higher education post-doctoral fellows and postgraduate students (headcount and FTEs), South Africa, 2010/11 to 2014/15

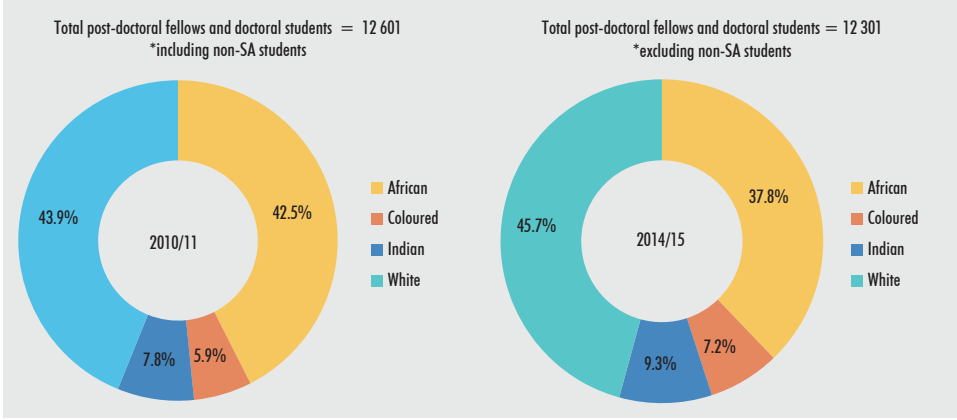


Data note	Masters students are not counted as R&D personnel according to the Frascati Manual.
Data source	National Survey of Research and Experimental Development, 2010/11 to 2014/15

5.3.3 Post-doctoral fellows and doctoral students by population group

In 2010/11, 43.9% of all post-doctoral fellows and doctoral students were White and 42.5% were African; these included non-South African students. The figures for the 2014/15 survey excluded non-South African students. Of the South African post-doctoral fellows and doctoral students in 2014/15, 45.7% were White and 37.8% were African. The percentage of Indian postgraduate students increased from 7.8% in 2010/11 to 9.3% in 2014/15, as well as the percentage of Coloured postgraduate students – from 5.9% in 2010/11 to 7.2% in 2014/15.

Figure 31: Higher education post-doctoral fellows and doctoral students by population group (percentage), South Africa, 2010/11 and 2014/15



Data note	The data on post-doctoral fellows and doctoral students for 2010/11 included non-South African students. The R&D survey began distinguishing between data of South African and non-South African nationals in 2014/15.
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, 2010/11 and 2014/15

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

A total of 19 756 post-doctoral fellows and doctoral students (headcount) were reported for 2014/15; of these approximately 62.3% were South African and 37.7% were non-South African. An analysis of postgraduate students by qualification for the 2014/15 survey showed that the majority of masters and doctoral students were South African nationals, but non-South African nationals were in the majority (66.9%) among post-doctoral fellows. The numbers of foreign post-doctoral fellows, doctoral students and masters students increased between 2013/14 and 2014/15. The South African post-doctoral fellows increased between 2013/14 and 2014/15, whilst the doctoral and masters students showed a marginal decrease in the same period.

Figure 32: Higher education post-doctoral fellows and doctoral students by nationality (headcount), South Africa, 2014/15

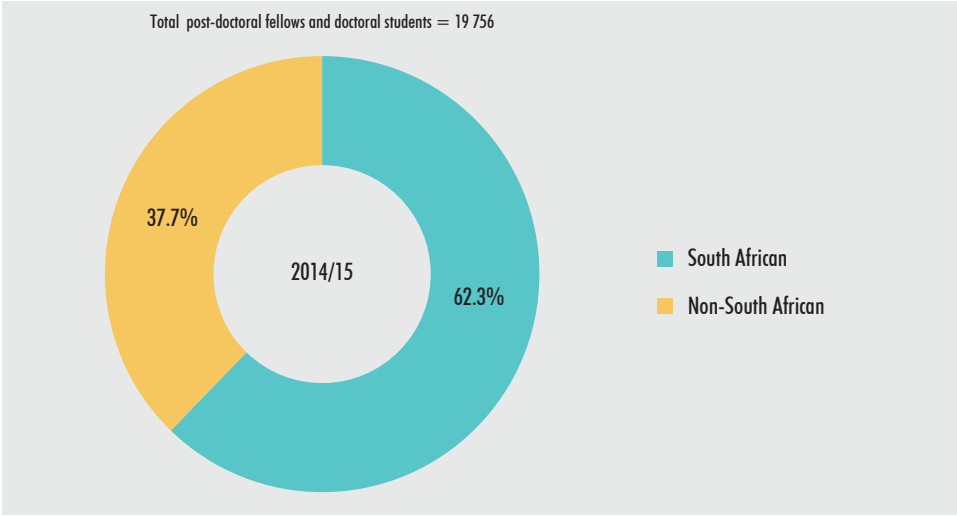
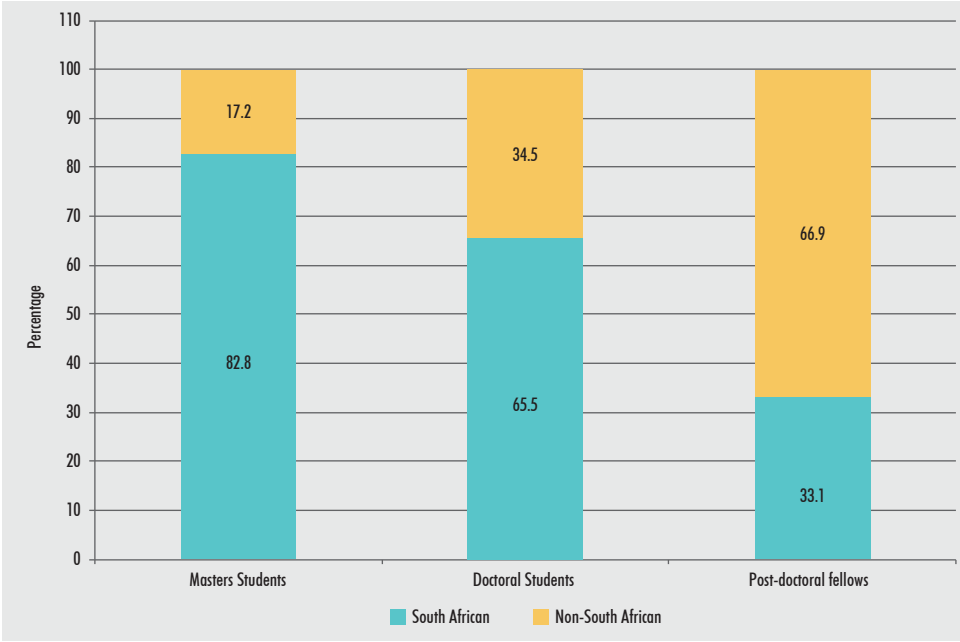


Figure 33: Higher education postgraduates by qualification (headcount), South Africa, 2014/15



Data note	The 2014/15 survey distinguished between South African and non-South African nationals.
Data source	National Survey of Research and Experimental Development, 2014/15

Table 6: Higher education postgraduates by qualification (headcount), 2011/12 to 2014/15

HIGHER EDUCATION POST-GRADUATE STUDENTS	2011/12			2012/13			2013/14			2014/15		
	SOUTH AFRICAN	NON-SOUTH AFRICAN	TOTALS	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	29 598	6 148	35 746
Doctoral Students	10 135	3 384	13 519	9 822	4 308	14 130	11 778	4 342	16 120	11 644	6 129	17 773
Post-doctoral fellows	538	642	1 180	511	873	1 384	616	1 185	1 801	657	1 326	1 983
Grand Total	39 804	10 532	50 336	39 697	10 954	50 651	43 818	10 377	54 195	41 899	13 603	55 502

Data note	The 2011/12 to 2014/15 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 2014/15

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 46.6% (R13.687 billion) of GERD in 2014/15. Western Cape and KwaZulu-Natal provinces together were responsible for 30.7% of GERD in 2014/15, with the Western Cape being responsible for R5.814 billion and KwaZulu-Natal for R3.188 billion. There was a 3.1% increase in the proportion of GERD spent in the other provinces, from 19.6% in 2010/11 to 22.7% in 2014/15. Between 2010/11 and 2014/15, Outside the dominant three provinces, Eastern Cape, Free State and North West provinces have contributed the most to R&D expenditure (Table 7).

Table 7: R&D expenditure by province (R'000 and percentage), South Africa, 2010/11 and 2014/15

PROVINCE	2010/11		2014/15	
	R'000	%	R'000	%
Eastern Cape	1,048,959.0	5.2	1,734,410.5	5.9
Free State	1,332,224.0	6.6	1,456,460.6	5.0
Gauteng	9,772,806.0	48.3	13,686,733.7	46.6
KwaZulu-Natal	2,290,711.0	11.3	3,187,480.9	10.9
Limpopo	395,042.0	2.0	628,607.0	2.1
Mpumalanga	397,878.0	2.0	859,200.5	2.9
North West	532,456.0	2.6	1,402,742.0	4.8
Northern Cape	250,320.0	1.2	575,584.2	2.0
Western Cape	4,233,409.0	20.9	5,813,757.9	19.8
TOTAL	20,253,805.0	100.0	29,344,977.3	100.0

Data source	National Survey of Research and Experimental Development R&D, 2010/11 and 2014/15

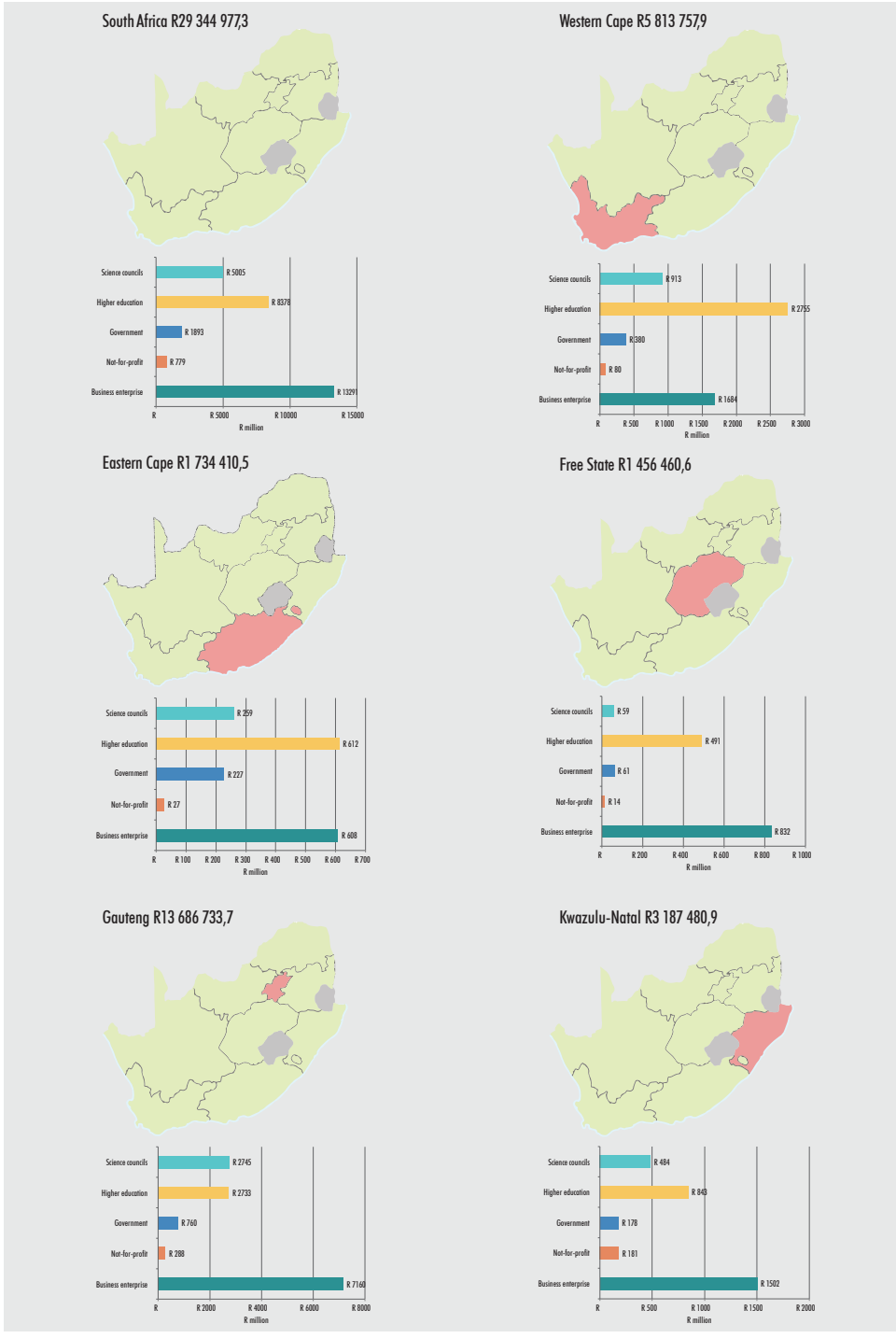
6.2 Proportions of R&D expenditure by sector

Provincial R&D expenditure by the five R&D-performing sectors varied (Figure 34). The contribution of the business sector was predominant in Gauteng (53.9%), Western Cape (12.7%) and KwaZulu-Natal (11.3%) provinces during 2014/15.

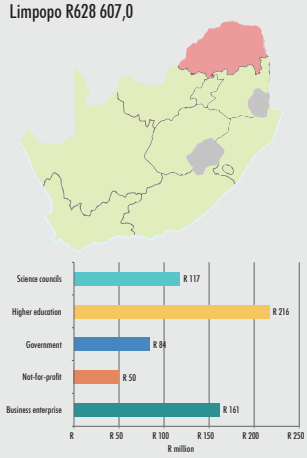
The highest proportion of R&D expenditure by the government sector was recorded in Gauteng (40.2%), Western Cape at (20.1%) and Eastern Cape (12.0%). The higher education sector contributed a significant proportion of R&D expenditure in the Western Cape (32.9%), Gauteng (32.6%) and KwaZulu-Natal (10.1%) provinces (Figure 34).

Looking back, R&D was largely performed in the same three provinces in 2010/11 (Table 8 provides the equivalent data that is visualised in the maps but for the early period.). The differences occur when R&D by sector are compared within provinces. There are fluctuations where in some cases R&D performed in one sector is higher in 2010/11 than in 2014/15 or *vice versa*. Science councils and higher education are the only two sectors where the 2014/15 R&D expenditure exceeds the expenditure in 2010/11 in every province. The picture in Government institutions and NPOs is different; R&D expenditure in 2010/11 exceeds R&D expenditure in 2014/15 in most of the provinces. This could be attributed to the dynamism of these sectors and or the informal R&D (R&D that is not performed regularly) in these sectors. An example is the R&D survey in the NPO sector: in preparation for the 2014/15 R&D survey, 11 entities were marked as out of scope, that is they no longer performed R&D. At the same time, 11 new entities were confirmed as R&D active and added to the NPO frame. One of these entities was responsible for the increased R&D expenditure and personnel in the NPO sector.

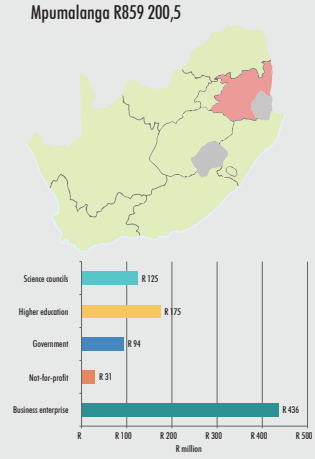
Figure 34: R&D expenditure by province (R million), South Africa, 2014/15



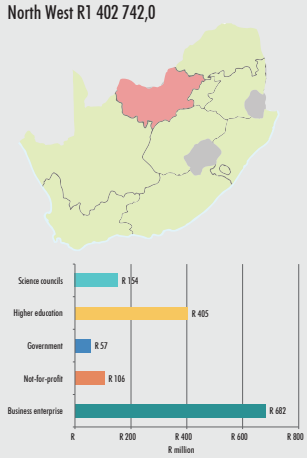
Limpopo R628 607,0



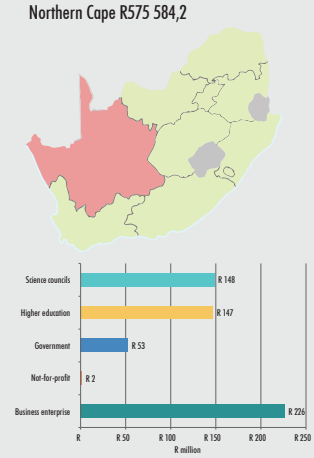
Mpumalanga R859 200,5



North West R1 402 742,0



Northern Cape R575 584,2



Data source	National Survey of Research and Experimental Development R&D, 2014/15

Table 8: R&D expenditure by province and sector of performance (R'000 and percentage), South Africa, 2010/11

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	217,880	2.2	114,127	11.3	556,496	10.3	9,790	6.0	150,665	4.2	1,048,959	5.2
Free State	943,508	9.4	39,998	4.0	281,889	5.2	6,385	3.9	60,443	1.7	1,332,224	6.6
Gauteng	5,439,718	54.1	343,096	33.9	1,600,783	29.5	61,496	37.8	2,327,712	64.7	9,772,806	48.3
KwaZulu-Natal	1,280,014	12.7	48,056	4.8	677,740	12.5	35,765	22.0	249,137	6.9	2,290,711	11.3
Limpopo	41,850	0.4	57,797	5.7	224,603	4.1	4,541	2.8	66,250	1.8	395,042	2.0
Mpumalanga	139,771	1.4	69,980	6.9	119,231	2.2	13,206	8.1	55,690	1.5	397,878	2.0
North West	256,428	3.6	43,048	4.3	184,514	3.4	5,612	3.4	42,854	1.2	532,456	2.6
Northern Cape	17,017	0.2	58,918	5.8	107,581	2.0	2,030	1.2	64,774	1.8	250,320	1.2
Western Cape	1,722,823	17.1	236,320	23.4	1,671,766	30.8	24,003	14.7	578,497	16.1	4,233,409	20.9
TOTAL	10,059,009		1,011,340		5,424,603		162,828		3,596,022		20,253,805	100

7. INTERNATIONAL COMPARISONS

7.1 Gross domestic expenditure on R&D

The purpose of this section is to compare R&D performance in South Africa in comparison with selected countries. The comparison takes into account the differences in economic structures between countries as well as the availability of current and up-to-date data. The country selection comprised a combination of African countries that had datasets for the survey period, newly industrialised countries, the BRICS countries and other developing countries, and selected top R&D-performing countries and regions.

7.1.1 GERD for selected countries

Total global R&D expenditure has increased over the past few years and will continue to do so in the future (UNESCO, 2014; Battelle & R&D Magazine, 2016). R&D is concentrated and persists in certain regions, sectors, and industries. The impact of the global economic crisis on R&D and the pace of recovery from the slow-down 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). These are countries that are reported to be driving shifts in global composition of R&D and estimates are that accelerated future growth in R&D will still be from Eastern countries (Battelle & R&D Magazine, 2016)

Table 9 shows that between 2012/13 and 2014/15, there were overall increases in GERD measured in terms of US dollar purchasing power parity (PPP$) for most of the selected countries, except Argentina, Spain, Italy and Finland. South Africa's GERD increased from $5 022 billion in 2013/14 to billion to R5 5526 in 2014/15, which represented an increase of 10.0%.

Table 9: GERD for selected countries (million current PPP$), 2012/13 to 2014/15 or latest available year

COUNTRY		2012/13		2013/14		2014/15
Argentina	p	5 256	p	5 332	p	5 014
Mexico		9 799		10 297	cp	11 587
Turkey		12 807		13 847		15 338
OECD Total	p	1 091 447	p	1 144 917	p	1 181 495
United States	j	437 081	j	457 612	j	479 358
China		292 197		334 135		370 116
Japan		152 326	a	162 347		166 861
Germany		100 490		102 998		110 170
France		55 098		58 406	e	59 582
Russian Federation		37 911		36 614		39 863
Italy		27 417		28 485	c	30 126
Egypt		4 749		6 167		6 402
EU 28	b	341 234	b	355 983	b	372 574
Spain		19 269		19 300		19 359
Poland		7 991		8 193		9 195
Finland		7 520		7 390		6 718
Brazil		35 462		39 704		*
South Africa		4 308		5 022		5 526
Chile		1 356		1 537	e	1 617
India (2011)		48 062	c	*		*

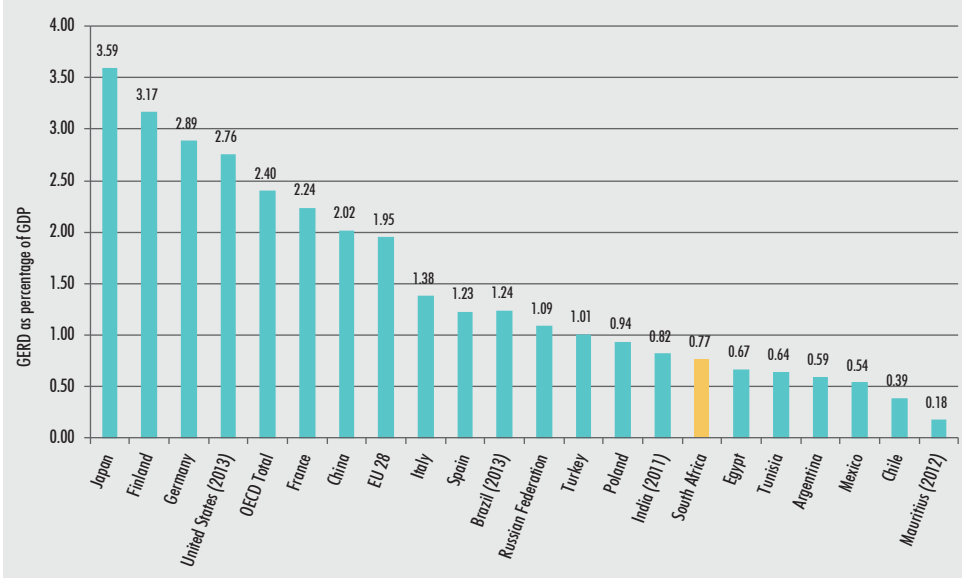
Data note	a) Break in series with previous year for which data are available b) Secretariat estimate or projection based on national sources c) National estimate or projection d) Excluding most or all defence expenditure e) Provisional *Data not available
Data source	South Africa: National Survey of Research and Development, 2014/15; Argentina, Chile, China, Finland, France, Germany, Italy, Japan, Mexico, OECD Total, Poland, Russian Federation, Spain, Turkey, United States: OECD, 2016 Brazil, Egypt, India: UIS

7.1.2 GERD as a percentage of GDP

GERD as a percentage of GDP was 0.77% for South Africa in 2014/15. GERD as a percentage of GDP varied among African countries: Egypt, Tunisia and Mauritius reported their research intensity as 0.67%, 0.64% and 0.18% respectively. GERD as a percentage of GDP exceeded 1.00% for the BRICS member countries other than India (0.82%) and South Africa (0.77%); China recorded R&D intensity of 2.02%, followed by Brazil at 1.24% and the Russian Federation at 1.09%.

Some research-intensive countries exceeded GERD intensity of 2.50%, including Japan (3.59%), Finland (3.17%), Germany (2.89%) and the USA (2.40%). 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 1.95%.

Figure 35: GERD as a percentage of GDP for selected countries, 2014/15 or latest available year



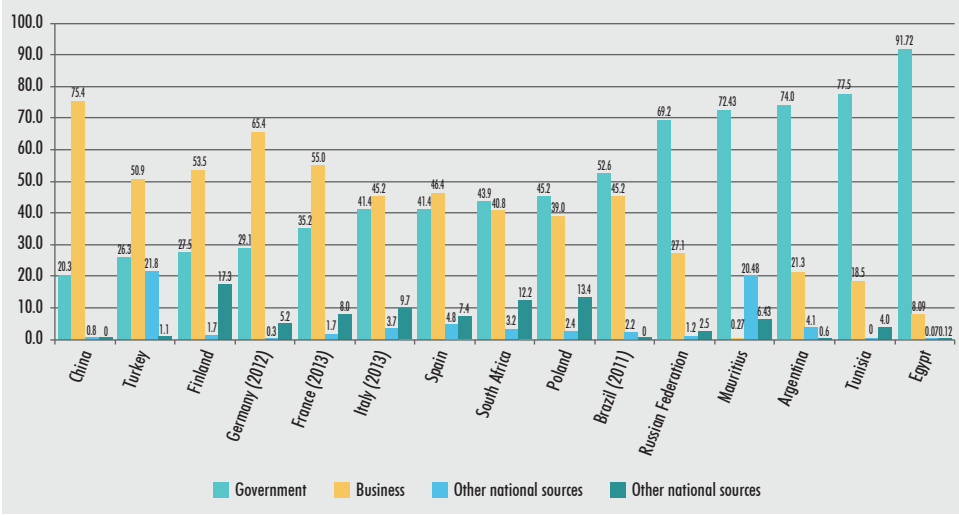
Data note	Reported data are for the 2014/15 financial year or the latest available year as indicated in brackets. Calculations are based on current national currencies.
Data source	Country data: South Africa: National Survey of Research and Experimental Development, 2014/15 Argentina, Chile, China, EU 28, Finland, France, Germany, Italy, Japan, Mexico, OECD Total, Poland, Russian Federation, Spain, Turkey, United States: OECD, 2016 Brazil, Egypt, India, Tunisia: 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 and middle-income or developing countries, and the not-for-profit sectors also play a major role in funding R&D. Business is typically most active in funding R&D in research-intensive countries.

South Africa falls between these two patterns, as Figure 36 illustrates. In 2014/15, 43.9% of R&D funding came from government and 40.8% from the business sector. South Africa began in the 2013/14 survey cycle to follow the model of funding that developing countries have. This is not by design but probably because of the decline in funding of R&D by the business sector. Argentina, Egypt, the Russian Federation, Mauritius, Brazil, Poland, Spain, Tunisia 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 (75.4%), Germany (65.4%), Finland (53.5%), Turkey (50.9%) and France (55.4%).

Figure 36: GERD by source of funds in selected countries (percentage), 2014/2015 or latest available year



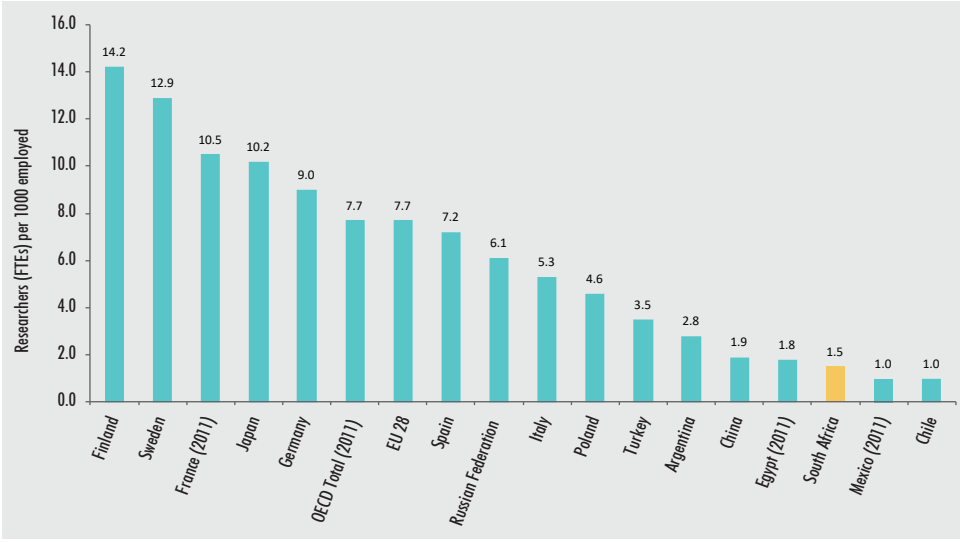
Data note	Data are for 2014/15 or the latest available year as indicated in brackets. Other national sources include the not-for-profit and higher education sectors.
Data source	Country data: South Africa: National Survey of Research and Experimental Development, 2014/15 Argentina, Mexico: OECD, 2016 Brazil, Spain, Italy, Poland, Russian Federation, China, Germany, Finland, France: UIS, 2014

7.2 R&D personnel

7.2.1 Researcher full-time equivalents (FTEs) per thousand in total employment

The researcher FTEs per thousand employed dropped from 1.6 in 2013/14 to 1.5 in 2014/15. South Africa's figure of 1.5 was comparable with some of the BRICS countries, namely Brazil and China. China measures particularly low on this indicator despite having the largest overall number of researchers compared with other BRICS countries. In the Russian Federation, researchers per thousand employed (6.1) was much higher in comparison to any of the other BRICS countries. Sweden and Japan reported more than 10.0 researchers per thousand employed, while Finland reported 14.2.

Figure 37: Researchers per 1 000 in total employment in selected countries, 2014/15

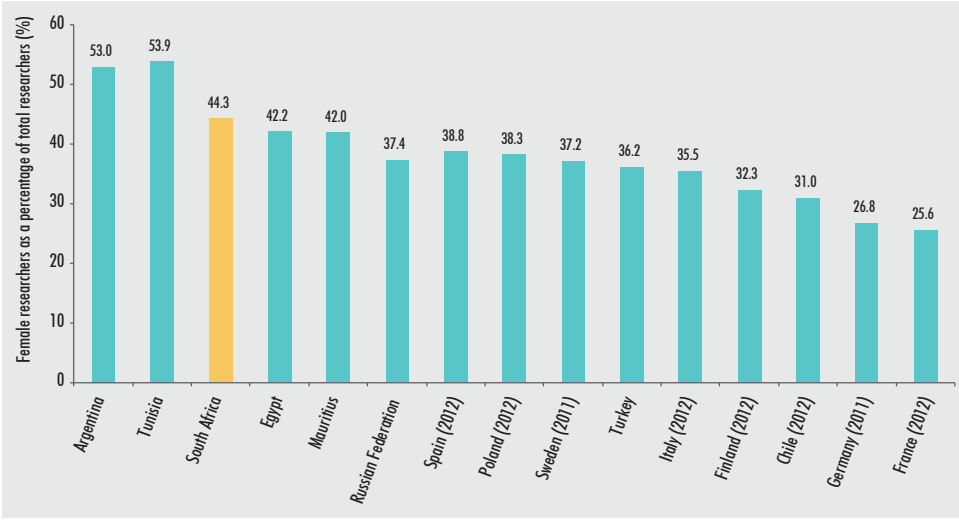


Data note	Data are for 2014/15 or the latest available year as indicated in brackets. Other national sources include the not-for-profit and higher education sectors.
Data source	Country data: South Africa: National Survey of Research and Experimental Development, 2014/15 Argentina, Mexico, China, EU 28, Finland, France, Germany, Italy, Japan, OECD Total, Poland, Russian Federation, Spain, Sweden, and Turkey: OECD, 2016

7.2.3 Female researchers as a percentage of total researchers

In South Africa and several other 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. The proportion of female researchers in South Africa was 44.3% of total researchers in 2014/15 (Figure 38). South Africa has improved on this indicator gradually over the last eight years. Female researchers form a higher proportion of total researchers in developing countries than in most of the developed countries.

Figure 38: Female researchers as a percentage of total researchers (headcount) in selected countries, 2014/15 or latest available year



Data note	Data are for 2014/15 or the latest available year as indicated in brackets. Female researchers as a percentage of total researchers were not available for most countries. Other national sources include the not-for-profit and higher education sectors.
Data source	Country data: South Africa: National Survey of Research and Experimental Development, 2014/15 Argentina, Chile, China, Italy, Poland, Russian Federation, Turkey: OECD, 2016

8. CONCLUDING REMARKS

The 2014/15 National Survey of Research and Experimental Development was the fourteenth survey conducted by CeSTII since 2001/02. Data collected through the R&D surveys can provide useful insights into some unanswered research and policy questions.

The R&D data has so far proven to be a valuable resource given its wide use in and outside of South Africa. The data forms part of the evidence required to inform the setting and monitoring of policy targets and programmes. Examples include the Ten-Year Plan for South Africa of the DST (DST, 2008), and the National Development Plan. The data is also used for benchmarking purposes and informs research and studies undertaken by other stakeholders. Data requests have increased over the past few years and the requests enrich the survey in that they assist in the identification of the new user needs.

In collaboration with other international bodies, CeSTII has gained vast experience in data collection but continues to improve the quality of the data through measures of improving coverage and response rates. A full methodology on how the quality of the survey is improved can be accessed in the 2014/15 Survey Statistical Report corresponding to this report.

The next R&D survey results are expected in the fiscal year 2017/18.

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METHODOLOGICAL NOTES

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 2014/15 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 17 August 2015 to 31 March 2016.

For science councils and all government departments, the survey covered expenditure in the year beginning 1 April 2014 and ended 31 March 2015. The data collected for the business and NPO sectors were for the financial year ended 28 February 2015 (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 2014 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 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.

NOTIFICATIONS

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/departments/cestii

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, Statistics South Africa and the Human Sciences Research Council's Centre for Science, Technology and Innovation Indicators 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.

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 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?

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).

9. What did you like best about the publication?

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

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