THE UNIVERSITY
OF AUCKLAND

FACULTY OF SCIENCE

The University of Auckland Department of Statistics

Career pathways

for statistics graduates

Contents

Executive Summary

The amount of data available to organisations grows daily. But data is of little use for its own sake. Data that is analysed and turned into information *that contributes to better decisions, better outcomes, and better performance*, however, is essential to building New Zealand's wealth and competitiveness. This is the realm of statistics.

Not surprisingly, good statistics graduates are in demand. At the heart of the responses that contributed to this report, was a sentiment that many employers expressed:

If a graduate has good statistical skills, good interpersonal skills, and the ability to translate statistical concepts into language that lay people can understand, the world is their oyster.

Over and over, employers talked of roles requiring good quantitative skills that were *interesting, exciting, and challenging*. These were the **roles of the future**. Roles that determined the strategic direction of organisations, that contributed to leading edge scientific research, that determined the marketing focus of businesses, that delivered the best returns on funds invested, that optimised the performance of systems and processes, and that contributed to the quality of New Zealand's education and healthcare.

In line with this, those who complement their core degree with statistics can be promoted into some of the best paying roles in the areas reviewed. For example, graduates who have taken statistics alongside finance and economics, who are working in areas such as risk analytics, marketing insights, and investment analysis, are in some of the **best paying and most prestigious roles** in banks and financial institutions.

Despite being relatively inexperienced, graduates are also in **consulting roles**, in marketing, market research, operations research, and organisational psychology – contributing to improvements in the well-being of organisations, the quality of products and services provided, and the effectiveness and efficiency of the processes and systems used.

In addition, graduates with a strength in statistics have h**ighly transferrable skills that can be employed across a wide range of industries and countries**. In other words, the variety that opens up to statistics graduates, once they have proved they have the skill to contribute effectively, is huge.

Not surprisingly, this is matched by **a strong demand for these candidates**. Employers frequently commented, that good people with good quantitative skills were hard to find, that there were not enough graduates with the requisite skills to meet the demand that currently exists.

This demand is not going to slow down. The amount of data available to organisations is exploding. Couple this with an increasing understanding of the *value of the information contained within that data*, and it becomes clear – **the demand for good statistical and quantitative skills is set to grow**.

The key now is getting the word out there to ensure students fully understand the opportunity that statistics can open up for them, *if they are serious about their future*.

Introduction

This report identifies the career pathways that open up to graduates who undertake two or more papers in statistics to *enhance their learning and employability in another core discipline*. It also identifies some of the career options available to graduates who major in statistics and/or take statistics to postgraduate level.
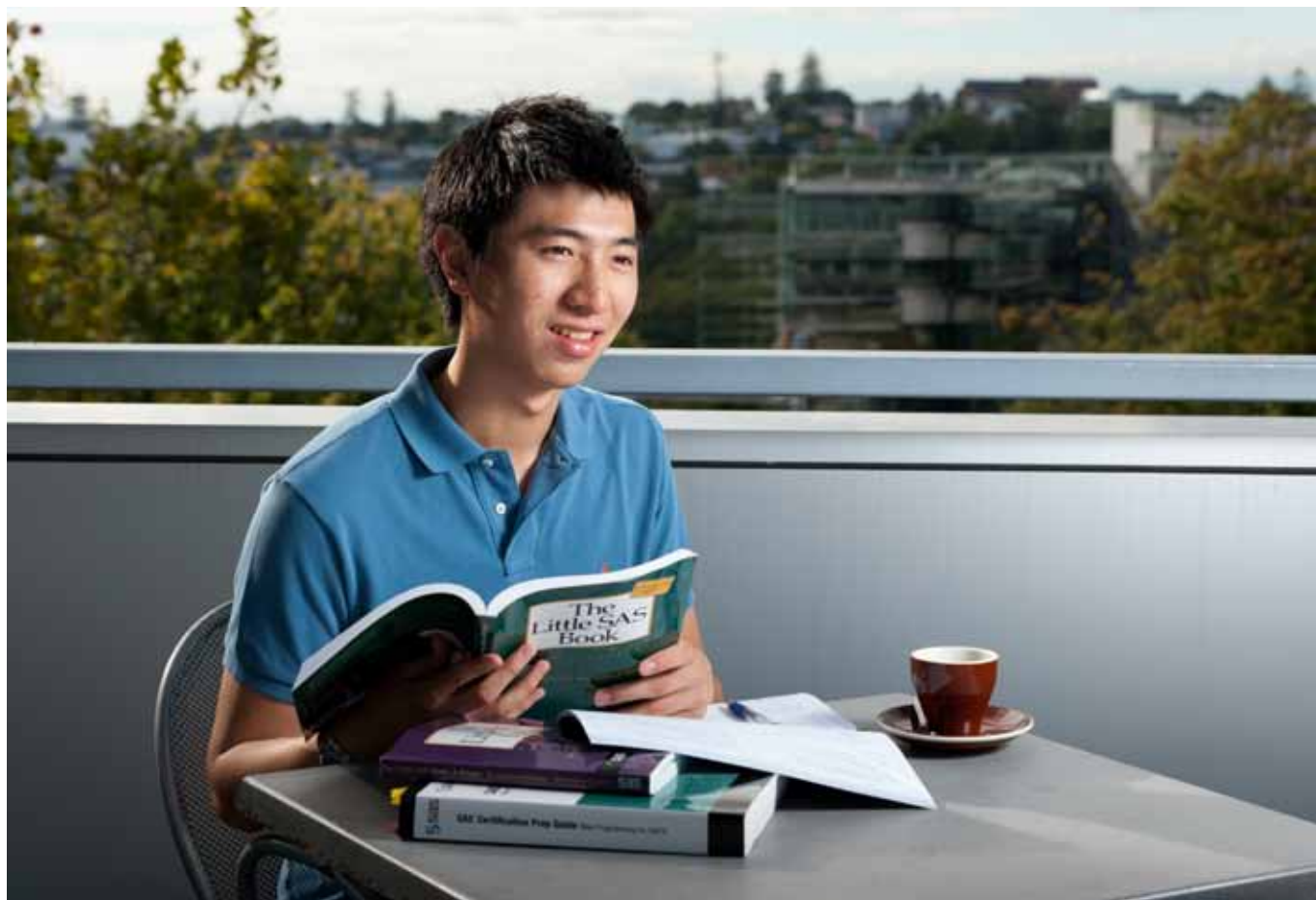
Subject areas and career pathways reviewed

The following sections provide an overview of those subject areas and career pathways most likely to appeal to students with an interest in and aptitude for statistics, who take additional courses in statistics to complement their core subject or degree area. It then identifies the career opportunities this will open up for them, if they make this choice.

Subject areas	Career pathways
Finance & Banking	Financial Analyst Banking, Investment Analyst
Marketing	Consumer Insights Analyst
Market Research and Marketing Science	Research Executive, Quantitative Analyst, Marketing Science
Operations Research and Business Analysis/Intelligence	Operations Research Consultant, Strategic Analyst
Actuary	Actuary
Biological Sciences	Bioinformatics, Ecologist, Statistician/Biometrician
Medical Statistics	Medical Statistician
Industrial and Organisational Psychology	Organisational Psychologist
Education	Teacher, Senior School
Government	Analyst, Research Analyst, Intelligence Analyst, Financial Forecasting and Modelling Analyst
Local Government	N/A
Energy	Wholesale Markets Analyst
Engineering – Product Design and Development	Product Development Engineer

What employers say

The following answers were given in response to the question, "If a young student, interested in working in the same field as you, came to ask your advice on what they should do, what would you tell them?"

"Stats is becoming more and more important for solving business problems ... It is very untapped – it is talked about, but not done well – yet. Businesses are not yet understanding how analytics can help them."

Joe Robbins, Market Insights Manager, Consumer Analytics, Telecom

"The new wave in consulting is quantitative analysis"

Phil Shepherd, CEO, Harmonic Consulting

"Look at the amount of data out there. This area is only going to grow, because it's new, it's totally innovative."

Mark Wilson, Director, Twenty Ltd.

"Statistics is key... There are so many different opportunities and lines of work, and businesses that need statisticians - you can almost take your pick."

Duncan Smith, Manager, Marketing Science, Colmar Brunton

"If you're doing Social Sciences, consider doing Statistics – it will give you a huge edge."

David Fougere, CEO, Phoenix Research

"More and more data is being produced – those that can deal with this are becoming very highly sought after."

Alasdair Nobel, Biometrics Team Leader , Plant & Food Research

"Statistics opens the door to so many different things. It gives you the freedom to move around – huge variety. You'll be working with internationally recognised scientists; working at the edge"

Harold Henderson, Senior Statistician, AgResearch

"We need more people. Good people with good quantitative skills are hard to come by."

Martin Cryer, Science Manager, Fisheries

"If you have any skills in the quantitative side, cultivate them. They will give you the edge."

Ian Westbrooke, Statistician, DOC

"There are a huge range of opportunities [for statisticians] throughout government ... they can do everything. The world's their oyster. This is not an area that is standing still – it is moving at a speed people have to catch up with. It's fun, exciting."

Sharleen Forbes, Statistician, Statistics NZ

"Do Statistics - the higher the better. The opportunities are stronger with stage two or stage three – there are more choices in the jobs you can apply for, [it] helps you stand out when you apply."

Heleen Visser, Manager, Research and Evaluation, Ministry of Education

"Embrace statistics – it is so valuable... Feel the fear and do it anyway.... With statistics, you get real confidence that you will make a difference."

Anne Fulton, Director, TalentTech

"Statistics techniques give insight into how to predict [what will happen]. It gives robustness to decision making..., can help you direct and lead others, and [gives] confidence about what you see and what you know."

Grant Allerby, Head of Risk Analytics, Westpac

"This is a very exciting area – these roles are really valued ... You can be responsible for changing the direction of the company. You have the potential to make a contribution you can be really proud of."

Craig Scott-Hill, Senior People Consultant, Meridian Energy (on the role of Strategic Analyst)

"We are in high demand. Companies just want more, more, more. We can't stop the floodgate of demand for Statistics."

Vince Mauder, Director of Analytics, Loyalty NZ.

Methodology

The methodology used to obtain the information in this report is as follows:

1. Discussions were held to identify those subject areas that statistics complements well and which were likely to be of interest to a relatively large number of students

2. Interviews were held with staff from the Department of Statistics, who had knowledge and experience in these subject areas.

   The focus of these interviews was on identifying which statistics courses students would: (i) need to have, and which were (ii) nice to have, if they were interested in a career in that area. This included both undergraduate and postgraduate courses – and included questions around the relevance of undertaking postgraduate work for the career in question. Staff members were also asked for referrals to employers.

3. Interviews were then held with people in management positions, who had responsibility for recruiting graduates in the career areas identified. (See Appendix One for a list of Interviewees.) The focus of these interviews were as follows:

(i) The nature of the role they employed graduates in, including the key tasks undertaken

(ii) The degree(s) they preferred graduates to have

(iii) The skills and attributes they looked for

(iv) The career opportunities that open up for graduates – both within and outside their organisation

(v) What they look for when considering graduates for promotion

(vi) What advice they would give students interested in working in their field

(vii) Who else in the area they would recommend we speak with

Notes were taken in as close to the original wording as possible, to retain the intended meaning and content of the interviews.

Statistics courses and career pathways

Statistical skills support an extraordinarily wide range of careers. Use the following table to help you plan your course programme and achieve your career aspirations.

Undergraduate courses

Stage One

STATS 10X Introduction to Statistics	**Finance**	**Actuary**	**Marketing**	**Market Res**	**Org Psych**	**Ecology**	**Bioinformatics**
STATS 125 Probability and its Applications	Finance	**Actuary**		Market Res		Ecology	Bioinformatics
STATS 150 Lies, Damned Lies, and Statistics			Marketing	Market Res			

Stage Two

STATS 20X Data Analysis	**Finance**	**Actuary**	**Marketing**	**Market Res**	**Org Psych**	**Ecology**	**Bioinformatics**
STATS 210* Statistical Theory	**Finance**	**Actuary**		Market Res		Ecology	**Bioinformatics**
STATS 220 Data Technologies	Finance			Market Res		Ecology	**Bioinformatics**
STATS 255 Intro to Operations Research							

Stage Three

STATS 301 Stat. Prog. & Modelling using SAS	Finance	Actuary		Market Res			
STATS 302 Applied Multivariate Analysis			Marketing	**Market Res**	Org Psych	**Ecology**	**Bioinformatics**
STATS 310 Intro to Statistical Inference	**Finance**	**Actuary**					
STATS 320 Applied Stochastic Modelling	Finance	**Actuary**					
STATS 325 Stochastic Processes	Finance	Actuary					
STATS 326 Applied Time Series Analysis	**Finance**			Market Res			
STATS 330 Statistical Modelling	Finance	Actuary	Marketing	**Market Res**	Org Psych	**Ecology**	**Bioinformatics**
STATS 331 Introduction to Bayesian Statistics					Org Psych	Ecology	Bioinformatics
STATS 340 Design & Analysis of Surveys & Exp.			Marketing	**Market Res**	**Org Psych**	**Ecology**	Bioinformatics
STATS 370 Financial Mathematics	**Finance**	**Actuary**					
STATS 380 Statistical Computing		Actuary				Ecology	Bioinformatics

Med Stats	Statistician (eg.Biometrician)	Academic Research	Education	Government	Ops Research	Engineering	Energy
Med Stats	**Statistician (eg.Biometrician)**	**Academic Research**	**Education**	**Government**	**Ops Research**	**Engineering**	**Energy**
Med Stats	Statistician (eg.Biometrician)	**Academic Research**	Education		**Ops Research**		**Energy**
			Education	**Government**			
Med Stats	**Statistician (eg.Biometrician)**	**Academic Research**	**Education**	**Government**	**Ops Research**	**Engineering**	**Energy**
Med Stats	**Statistician (eg.Biometrician)**	**Academic Research**	Education		**Ops Research**	Engineering	**Energy**
Med Stats	Statistician (eg.Biometrician)	Academic Research		Government	Ops Research		Energy
					Ops Research	Engineering	Energy
Med Stats	Statistician (eg.Biometrician)	Academic Research		**Government**			
Med Stats	Statistician (eg.Biometrician)	Academic Research					Energy
Med Stats	Statistician (eg.Biometrician)	**Academic Research**					Energy
		Academic Research			**Ops Research**		Energy
		Academic Research			**Ops Research**		Energy
		Academic Research		Government	Ops Research		**Energy**
Med Stats	**Statistician (eg.Biometrician)**	**Academic Research**	Education	**Government**		Engineering	
		Academic Research					
Med Stats	**Statistician (eg.Biometrician)**	Academic Research	Education	**Government**		Engineering	
					Ops Research		Energy
Med Stats	Statistician (eg.Biometrician)	**Academic Research**			Ops Research		Energy

Statistics courses and career pathways

Statistical skills support an extraordinarily wide range of careers. Use the following table to help you plan your course programme and achieve your career aspirations.

Postgraduate courses

Course	Finance	Actuary	Market Res	Ecology
STATS 705 Topics in Official Statistics		Actuary		
STATS 710 Probability Theory		Actuary		
STATS 723 Stochastic Methods in Finance	Finance	Actuary		
STATS 724 Operations Research		Actuary		
STATS 726 Time Series	Finance	Actuary		
STATS 730 Statistical Inference	Finance	Actuary		Ecology
STATS 731 Bayesian Inference				Ecology
STATS 740 Sample Surveys			Market Res	
STATS 747 Statistical Methods in Marketing			Market Res	
STATS 750 Experimental Design			Market Res	
STATS 761 Mixed Models				Ecology
STATS 766 Multivariate Analysis			Market Res	Ecology
STATS 770 Introduction to Medical Statistics				
STATS 771/BIOINF 704 Topics in Biostatistics				Ecology
STATS 773 Design and Analysis of Clinical Trials				
STATS 779 Professional Skills for Statisticians	Finance			Ecology
STATS 780 Statistical Consulting	Finance		Market Res	
STATS 782 Statistical Computing				
STATS 783 Simulation and Monte Carlo Methods				Ecology
STATS 784 Statistical Data Mining	Finance		Market Res	

The papers below are intended at postgraduate level for students who did not complete specific stage three papers. These 700 level papers are taught with t				
STATS 721 Stochastic Processes (STATS 325)	Finance	Actuary		
STATS 722 Financial Mathematics (STATS 370)	Finance	Actuary		
STATS 727 Applied Time Series Analysis (STATS 326)	Finance		Market Res	
STATS 732 Introduction to Statistical Inference (STATS 310)	Finance	Actuary		
STATS 741 Design & Analysis of Surveys & Exp. (STATS 320)			Market Res	Ecology
STATS 762 Statistical Modelling (STATS 330)	Finance	Actuary	Market Res	Ecology
STATS 767 Applied Multivariate Analysis (STATS 302)			Market Res	Ecology
STATS 785 Stat. Prog. & Modelling using SAS (STATS 301)	Finance	Actuary	Market Res	

Bioinformatics	Med Stats	Statistician/Biometrician	Academia	Government	Ops Research
				Government	
			Academia		Ops Research
					Ops Research
					Ops Research
					Ops Research
Bioinformatics			Academia		Ops Research
Bioinformatics		Statistician/Biometrician	Academia		
	Med Stats			Government	
		Statistician/Biometrician			
	Med Stats	Statistician/Biometrician			
Bioinformatics		Statistician/Biometrician		Government	
	Med Stats				
Bioinformatics		Statistician/Biometrician			
	Med Stats				
Bioinformatics	Med Stats	Statistician/Biometrician		Government	
	Med Stats	Statistician/Biometrician		Government	Ops Research
Bioinformatics			Academia		Ops Research
					Ops Research
Bioinformatics				Government	Ops Research

the 300 level paper but will require extra work:

Bioinformatics	Med Stats	Statistician/Biometrician	Academia	Government	Ops Research
					Ops Research
					Ops Research
				Government	Ops Research
	Med Stats	Statistician/Biometrician			
Bioinformatics	Med Stats	Statistician/Biometrician		Government	
Bioinformatics	Med Stats	Statistician/Biometrician		Government	
Bioinformatics	Med Stats	Statistician/Biometrician			
	Med Stats	Statistician/Biometrician		Government	

Financial Analyst, Banking

The role of an analyst is to turn data, such as customer records and transactions, into information that enables the bank to make decisions that optimise its performance.

Given the role banks have in lending money to individuals and businesses, they need to mitigate against the likelihood of default. Accordingly banks employ analysts to mine customer data for information that allows them to assess the risk profile of their customers, so they can take actions to minimise this risk.

Accordingly, a core function of financial analysts is building predictive models to determine the credit risk of a particular customer profile or group of customers in the future. Analysts also determine the lending assessment criteria for different loans, and ensure the bank meets its regulatory requirements regarding the amount of capital it must hold.

The key tasks undertaken by a new graduate, include:

• Preparing data for model development

• Developing risk models to determine the bank's capital requirements

• Building reports on portfolio performance

• Assisting with the development of marketing campaign criteria

Preferred degree(s)

Academic excellence is a prerequisite to obtaining employment in this area. Having said that, banks also look closely at the other attributes graduates bring to the role. An Honours is the minimum required by employers. A conjoint undergraduate degree is also strongly preferred, with Statistics and Finance being the preferred majors, followed by Operations Management/Research and Economics.

Preferred attributes and skills

• Being innovative – having the ability to come up with new ideas and options and to think outside the square

• Leisure activities that balance the academic excellence and show a candidate is well-rounded, eg, involvement in out-door activities and/or creative pursuits

• The ability to relate well to others and to fit easily into a team environment

• A drive for excellence and results

• Strong written and oral communication skills

• The ability to turn data into business information that is useful, and from which conclusions can be drawn and business problems solved

• Inquisitive and curious; a willingness to look past the obvious

• Initiative – a willingness to put themselves forward, and resilience, the ability to accept that not all suggestions will be adopted

Career pathways that open up (with experience or through promotion)

Internal progression, from Analyst to Senior Analyst to Team Leader, reflects a shift from 70% data preparation and 30% data interpretation (Analyst), to 50% data preparation and 50% data interpretation (Senior Analyst), to 30% data preparation and 70% data interpretation and insight (Team Leader). NB: During the five years it takes for a graduate to move through these three stages, their salary is likely to increase by 150%.

Many analysts choose to stay in analytics, either in the same area or in a different area, as the theories and techniques used are highly transferable across a range of functions and industries. If a graduate has management expertise, the next step after Team Leader is Risk Manager. From there opportunities are likely to open up both across the bank, and in financial and business management roles in other industries.

Employers' advice to students

"Statistics helps decipher what is good information and what is not … [and] management these days is all about managing information."

"Statistics techniques give insight into how to predict [what will happen]. It gives robustness to decision making…, can help you direct and lead others, and [gives] confidence about what you see and what you know."

"Statisticians haven't been valued for their ability to predict reality …. More and more we're trying to predict the future."

"In investment banking and corporate finance, having a minor or major in statistics is a great plus. These students would be qualified as smart, and able to do decent data analysis (a rare skill). Some of the best honours students in finance have a stats background."

Actuarial Analyst, Risk Services team at Lumley General Insurance (N.Z.) Limited

"I started off in a graduate role within Risk Management at Westpac. Currently, I work as an Actuarial Analyst for Lumley General Insurance in their Risk Services team. The purpose of the Risk Services team is to ensure that Lumley retains the right level of underwriting risk for the right price. The Risk Services team achieves this objective through the provision of analysis and advice on pricing and underwriting strategy, and through the management of reinsurance arrangements and relationships. We use statistical models built from insurance experience and other external information to provide the business with advice on pricing, performance and risk exposure.

"The thing I enjoy the most about statistics is having the tools to solve almost any problem, and being able to communicate those answers to a wider audience; I think being a problem-solver and having a tendency to take on challenges are the personality traits that synergise well with statistics.

"To do well in this sort of study and this sort of job, you need to be well- rounded; I think ideally you should have a balance of mathematical and English skills. You need to be comfortable with numbers, report writing, and coding. An interest in macroeconomics probably wouldn't go astray either."

Jason Michael Pushon, Bachelor of Science (Hons) in Statistics and Bachelor of Commerce in Economics.

Investment Analyst

An investment analyst assesses the quality and growth potential of a range of companies and industries, to determine which assets or equities to include in an investment portfolio, in order to maximise the returns on funds invested.

Initially the role is involved in background research and reporting, and includes the following tasks:

- Oversee portfolio positions at the end of each day

- Manage foreign exchange and interest rate positions

- Prepare monthly portfolio reports for clients

- Undertake research as required, eg, assessing stocks to verify investment decisions and weightings

- Manage corporate activity, for example, bonus issues, rights issues, and dividends

- Liaise with the company's Investment Custodians

Preferred degree(s)

To be employed as an Investment Analyst, graduates must firstly be smart. They must also have a minimum of an honours degree, with some employers preferring this to be in finance, and others preferring statistics. An undergraduate major in finance, statistics and/or mathematics is preferred, followed by economics. Having said this, some employers will consider a candidate with a good Honours, Masters or PhD in any subject area – as long as the candidate is bright and has the necessary skills.

Employers are unlikely to look at graduates unless they have at least two years work experience, and have, or are in the process of completing, the three year part-time qualification, Chartered Financial Analyst.

Preferred attributes and skills

- Exceptionally clear thinker

- Persuasive and influential

- Presents clearly and concisely, both orally and in written material and reports

- Is adaptable and resilient, and able to handle high levels of stress

- Has exceptional analytical skills, looks below the surface to what is really going on; pays attention to the detail

- Relates well to others; presents well, is comfortable in themselves, has good social skills

- Has a passion for finance and numbers

- Has balance in their life, a wide perspective, and interests outside work

- Is mature, street-wise and willing to learn, to ask the questions

Career pathways that open up (with experience or through promotion)

Normal progression is from Junior Analyst (sometimes called Position Keeper) to Analyst, to Portfolio Manager – though only a few make it to this level – then after significant experience, to Senior Management.

A wide range of alternative opportunities open up for Investment Analysts, moving into other analytical roles, into broking, senior Corporate Finance or Treasury roles, consulting and Directorships. The skills of an analyst are also widely transferrable overseas, to cities like Melbourne, Sydney, London and New York, as well as to other cities within Asia and the Pacific.

Employers' advice to students

"Do a CFA and get close to the CFA Society. Contact investment houses and offer your services as a student – all experience is great."

"Be curious, ask why, explore, learn – try and get to the underlying meaning. Have hypotheses and test them."

"Start by doing research on the market place, build your knowledge, start doing it, learning about it. Be a self starter. Do a CFA"

Recommended Courses in Statistics

Undergraduates

Need to have:	
STATS 108	Statistics for Commerce
STATS 208	Data Analysis for Commerce
STATS 210	Statistical Theory
STATS 310	Introduction to Statistical Inference
STATS 330	Statistical Modelling
Nice to have:	
STATS 125	Probability and its Applications
STATS 220	Data Technologies
STATS 301	Statistical Programming and Modelling using SAS
STATS 320	Applied Stochastic Modelling
STATS 325	Stochastic Processes
STATS 326	Applied Time Series Analysis
STATS 340	Design and Analysis of Surveys and Experiments
STATS 370	Financial Mathematics

NB: If a student is keen on a career in banking, then STATS 301 Statistical Programming and Modelling using SAS, must be in their list of 'Need to have' courses.

If, on the other hand, a student is interested in working in Corporate Finance, then STATS 325 Stochastic Processes, STATS 370 Financial Mathematics, and STATS 720 Stochastic Processes (below) move into the 'Need to have' list.

Postgraduates

Need to have:	
STATS 723	Stochastic Methods in Finance
STATS 726	Time Series
STATS 779	Professional Skills for Statisticians
Nice to have:	
STATS 720	Stochastic Processes
STATS 730	Statistical Inference
STATS 780	Statistical Consulting
STATS 783	Simulation and Monte Carlo Methods
STATS 784	Statistical Data Mining

Long-term interest rate trader for Deutsche Bank in Sydney

"Through looking at things like pricing models, the economics that drive financial markets and risk management, I'm able to take risk to support views on where interest rates are going. I also provide liquidity to clients who have interest-rate exposure as part of their business operations.

"I may be a little biased, but it would be hard to find another subject that is so widely applicable and useful to employers across the globe as statistics."

Nick Gray has a Bachelor of Commerce in Finance and a Bachelor of Science in Applied Mathematics and Statistics.

Marketing

Marketing is the process of identifying what a business needs to do to acquire, satisfy, and keep its customers. It is also the process of identifying the characteristics and preferences of a company's target customer group(s), of assessing which markets to enter, which to grow, and which to pull out of, and how to increase the effectiveness of its marketing campaigns. Accordingly, the marketing function plays a key role in determining the strategic direction of an organisation.

As companies gain access to more and more data, statistics becomes more essential in turning that data into useful information that enables them to become, or to stay, competitive.

Consumer Insights Analyst

A Consumer Insights Analyst provides a company with the ability to identify and understand: (i) the key characteristics of their target customer group(s), (ii) what their customers (really) want, (iii) what is required to keep customers satisfied and loyal, and (iv) what the company can do, or offer, to entice their customers to spend more.

The role of an Insights Analyst revolves around manipulating, interrogating, and interpreting data to gain a deep understanding of customer needs and behaviour, in order to position and promote the company's brands, so customers increase their spend. The key tasks involved, include:

- Identifying and developing research parameters

- Data preparation and manipulation

- Data interrogation

- Data interpretation; identifying the themes and trends contained in the data

- Developing predictive models to assess the impact of adding a new feature or option to an existing portfolio of products or services

- Translating the data into meaningful information or insights, and providing recommendations, relevant to the business context or marketing question being investigated

- Preparing and presenting reports for management

Preferred degree(s)

While a solid undergraduate degree with a major in statistics is sufficient for some employers, many larger employers prefer a postgraduate degree, and view an honours as the minimum. A conjoint undergraduate degree is strongly preferred, with a major in statistics supported by a major in economics, finance, or marketing (in that order of preference). Other majors that will be considered include computer science and mathematics.

Preferred attributes and skills

- Insightful, able to translate the numbers into meaningful information relating to the business or question being asked, and to business outcomes and performance

- The ability to sell an idea effectively, to persuade, to create a compelling argument or business case

- Good communication and presentation skills, in particular, the ability to articulate what the numbers mean in plain English, and to present the outcomes clearly and concisely

- A natural curiosity, an interest in emerging trends and techniques, and in finding new and better ways of doing things

- The ability to think and adapt quickly

- Enthusiasm and passion for the area

- Highly skilled in the use of SAS

- The ability to work well in a team environment

- A good work ethic, conscientious

Career pathways that open up (with experience or through promotion)

After working for a few years as an Analyst graduates can shift into other analytic streams, such as business intelligence, pricing, or pure marketing. That said, the next step after Analyst is Senior Analyst. The skills needed to progress to Senior Analyst, include the ability to apply theoretical concepts to the business, the experience, confidence and people skills to influence clients (both internal or external), the ability to identify and use cutting edge techniques and methodologies, and business acuity.

After Senior Analyst the world opens up. If passionate about the subject area, the next step can be to technical or subject expert. If the person has management potential, they may be considered for a leadership role, initially mentoring and coaching less experienced analysts as a team leader, and from there into more senior marketing or strategic management roles.

Other opportunities that arise with experience, include entering new and emerging areas of marketing, starting one's own business, working as a Marketing Consultant, and Company Directorships.

Employers' advice to students

"Stats enables you to focus on what's important … the significant results … and the likely impact from taking a particular course of action."

"Look at the amount of data out there, this area is only going to grow, because it's new, it's totally innovative."

"Taking a breadth of papers [at university] is important"

"Stick with the rigour, with the meaty subjects like Maths and Stats. Do programming for as long as you can. Put in the hard yards … But if you are a pure maths type of person, then broaden your scope, get the balance, because this is your hard yards."

"Stats is becoming more and more important for solving business problems … it's very untapped – it's talked about, but not done well yet. Businesses are not yet understanding how analytics can help them."

"Public speaking training is very useful"

"We are in high demand. Companies just want more more more. We can't stop the floodgate of demand for statistics."

Undergraduates

Need to have:	
STATS 108	Statistics for Commerce
STATS 208	Data Analysis
STATS 210	Statistical Theory
STATS 220	Data Technologies
STATS 301	Statistical Programming and Modelling using SAS
STATS 302	Applied Multivariate Analysis
STATS 330	Statistical Modelling
Nice to have:	
STATS 340	Design and Analysis of Surveys and Experiments

Postgraduates

Need to have:	
STATS 747	Statistical Methods in Marketing
STATS 784	Statistical Data Mining
STATS 762	Statistical Modelling
STATS 780	Statistical Consulting
Nice to have:	
STATS 751	Special Topic in Experimental Design

Senior Manager in Customer Intelligence at Westpac

"As a Senior Manager in Customer Intelligence at Westpac New Zealand I lead a team who use analysis and data mining to gain insights and in-depth knowledge of our customers. This involves monitoring and understanding what drives customers to the bank and how we can retain their business.

"An in-depth understanding of statistics is vital to my role at Westpac. The skills I gained at The University of Auckland, are highly sought after in the banking and financial sectors. The research and problem solving techniques I gained have helped me to adapt to new problems easily, and I have a solid foundation
of knowledge on which to build my career and make my mark on the world. "

Bonnie Law, Bachelor of Science (Hons), PhD in Statistics.

Market Research and Marketing Science

Market research companies provide businesses and other organisations with information about consumers and the public using qualitative and quantitative research.

These companies work in one or more of the following areas:

(1) Market Research; analysing a market, or markets – for a business, Government agency, or not-for-profit organisation

(2) Marketing Research; identifying the needs and preferences of a target group of customers in order to improve consumer satisfaction, and the quality of an organisation's marketing processes and promotional campaigns

(3) Marketing Science; applies advanced statistical modelling techniques and experiments to solve marketing problems.

There is a growing demand for market researchers who have expertise in gathering, interpreting and analysing statistical information. The key statistical techniques used include designing experiments and creating models that simulate the situation being investigated, so solutions to the marketing problem or questions can be identified.

Research Executive

Market Researchers identify what people want, need, or believe, and how they behave. This information is gathered to determine what policies to implement (Government), how to increase customer spend (businesses), and how to better meet client needs (not-for-profit organisations).

To this end, researchers gather and analyse information through questionnaires and opinion polls, identify market opportunities and threats, test consumer perceptions, assess the effectiveness of advertising campaigns, predict future market trends, and assist with marketing decisions.

The key tasks a Research Executive undertakes, include:

- Project design, including defining the client's needs and designing the methods by which the information will be collected and analysed

- Data gathering

- Data analysis

- Diagnosing the situation, developing projections, and identifying solutions

- Managing the client relationship, including writing proposals and consulting with clients

- Writing reports and presenting project outcomes to clients

Preferred degree(s)

This depends on the career focus and long term aspirations of the student. If the intention is to focus on social research, with more of a qualitative than quantitative focus, then Statistics to stage two is sufficient. This is likely to complement a bachelors degree in Psychology (preferably) or Sociology, Geography, or similar.

A major in Statistics is necessary, however, for anyone wanting to work in quantitative research; alongside a degree in Marketing, Commerce or the Social Sciences. A masters in any one of these subjects provides added skill depth and is viewed positively by employers, but is not essential for entry level roles. If the intention is to move into project management or management, however, then a masters is highly recommended.

Preferred attributes and skills

- Strong analytical skills, with the ability to discern patterns and themes that are not immediately apparent

- Highly inquisitive and naturally curious, is aware there can be multiple explanations for similar outcomes, and seeks to find these

- Has a high level of skill in Excel and SPSS (and SAS, if designing or leading quantitative research projects)

- Strong communication skills, including the ability to write clearly and concisely

- Relates well to people; is perceptive, reads people well

- Is able to turn insights into practical solutions

- Is smart, able to think on their feet

- Is open-minded and non-judgemental

- Has a real desire to learn

Career pathways that open up (with experience or through promotion)

Experience and the ability to take on increasingly complex roles, plus a high level client facing skill, is reflected in progression up the ranks from Research Assistant, to Research Executive (or Project Manager), to Senior Research Executive. If a graduate is keen to learn and has good skills, then this process will take around six years.

After this, it depends on the individual's capabilities and preferences. If a person has particularly good client facing and relationship management skills, the ability to see below the surface and identify effective client solutions, plus the ability to write research proposals and sell work, they may be promoted into the role of Assistant Research Director and Research Director. Alternatively, they may choose to stay in a specialist research role, move into qualitative research, or shift to another industry.

Senior Modelling Analyst at ASB Bank

"My role as a Senior Modelling Analyst in the Modelling Team within the Credit Risk Management department, is very heavily involved in statistics, mainly building advanced statistical models for ASB Bank. Prior to this role, I was working as a Segmentation and Modelling Analyst for Yellow™ Pages.

"My Postgraduate degree from The University of Auckland has given me an advantage over my competition in the employment market. Equipped with the cutting edge statistical modelling skills and data mining techniques that employers are desperately in need of, I found I was highly sought after in the job market. There are plenty of job opportunities out there for postgraduate statistic graduates, as these days every industry needs a statistician."

Chit Hock Choo, Bachelor of Science with majors in Statistics and Operations Research, Masters in Statistics.

Employers' advice to students

"If you are doing a social sciences degree, consider doing statistics – it will give you a huge edge."

"If you are doing pure statistics, consider complementing this with social sciences or marketing. A double degree is best."

Quantitative analyst, marketing science

Marketing Science involves statistical modelling, simulation, and optimisation. The role includes building simulation models at both the micro level (advertising, promotion, etc) and the macro level (eg, market segmentation, the marketing mix) to derive optimal solutions.

The role of a Quantitative Analyst includes data analysis, questionnaire design, assisting with proposal and report writing, and presenting project outcomes to the client. The key statistical tasks undertaken, include:

- Performing standard statistical analyses, such as correlation and regression analysis

- Applying customised statistical and numerical techniques to answer clients' questions

- Creating and maintaining online tracking data for clients, including providing updates on a monthly or quarterly basis for regular clients

- Creating and updating interactive dashboards for clients to give them on-going access to key results

- Undertaking conjoint or choice modelling to determine which features of a product or service customers value, and the price they are willing to pay

- Applying various statistical techniques, such as factor analysis, cluster or segmentation analysis and correspondence analysis

Preferred degree(s)

The minimum required by employers is a major in Statistics, but a masters in Statistics is strongly preferred.

Preferred Attributes and Skills

- Strong written and oral communication skills

- Strong analytical skills, including the ability to design statistical tools that go beyond the obvious and identify optimum solutions to client needs

- A high level of proficiency in Excel and SAS

- The ability to discern patterns and people in the numbers

- Good planning, organisation, and time management skills

- Relates well to others

- Is well-rounded, has good work-life balance

Career pathways that open up (with experience or through promotion)

Progression within Marketing Science tends to be into more complex roles on larger projects, ultimately leading projects, and is based on analytical skill development, and an interest in and aptitude for helping others achieve their goals. The role can also progress into client facing roles, where a candidate has the necessary people skills and business knowledge, or into management.

The skills of an analyst are highly transferrable across different businesses and industries, both in NZ and overseas, meaning that highly skilled graduates have the opportunity to move into analytical roles within large corporates, government agencies, or into consulting careers.

Employers' advice to students

"If you have core skills in SAS programming, statistics modelling, data management, and data mining, you will stand out – there's a scarcity of these skills – and a real opportunity to add incredible value … You can fast track your career … move into consulting and management roles because of the deeper insights you have."

"There are so many different opportunities and lines of work and businesses and companies that need statisticians, you can almost take your pick."

"There is so much variety – working on different projects, and across all industries and across NZ and Australia."

Recommended Courses in Statistics

Undergraduates

Need to have:	
STATS 108	Statistics for Commerce
STATS 208	Data Analysis
STATS 302	Applied Multivariate Analysis
STATS 330	Statistical Modelling
STATS 340	Design and Analysis of Surveys and Experiments
Nice to have:	
STATS 125	Probability and its Applications
STATS 210	Statistical Theory
STATS 220	Data Technologies
STATS 301	Statistical Programming and Modelling using SAS
STATS 326	Applied Time Series Analysis
STATS 331	Introduction to Bayesian Statistics

Postgraduates

Need to have:	
STATS 740	Sample Surveys
STATS 747	Statistical Methods in Marketing
STATS 780	Statistical Consulting
Nice to have:	
STATS 732	Introduction to Statistical Inference
STATS 750	Experimental Design
STATS 766	Multivariate Analysis
STATS 784	Statistical Data Mining

Operations Research and Business Analysis/Intelligence

In Operations Research, techniques such as mathematical modelling and optimisation, and statistical analysis are employed to derive the best solution to complex problems in business, industry, and government. The aim is to optimise the use of resources and process flows in order to maximise profit, performance or yield, or to minimise costs, risk or loss.

Consultant or Analyst

Operations research graduates work in a wide variety of businesses and industries, including health, transport, telecommunications, broadcasting, mining, and utilities. The aim is to turn data into meaningful information that can be used to increase the effectiveness or efficiency of systems, or to optimise resource allocation. As a result, Analysts or Consultants contribute to improvements in the design, performance, and management of large and complex systems.

Graduates tend to work as Consultants (for external clients) or as Analysts (within a single organisation).

Operations Research Consultant

The Operations Research assignments that Consultants work on, have four main stages: defining the project, designing and developing statistical models, statistical analysis, and writing up and presenting project outcomes. The key tasks involved at graduate level, include:

- Assisting with identifying and defining the requirements of the project

- Data preparation and data cleansing

- Statistical analysis, including some involvement in methodological design

- Working with the client to gather information and communicate the approaches being used

- Preparing project reports and assisting with the presentation of project outcomes

Strategic Analyst

A strategic analyst works within an organisation in a strategic advisory role and, while also identifying ways to optimise the outcomes of individual projects, may have a slightly different set of on-going accountabilities. For example:

- Maintaining, updating and improving key decision support tools

- Developing analytical tools that provide insight into business value, risk, and trade-offs

- Undertaking analysis to support projects and recommendations

- Providing long-term modelling support, which assesses: (i) the impact of adding a new feature or option to the company's existing portfolios and markets, or (ii) the best method of integrating a new product or service into an existing portfolio to achieve maximum value

- Carrying out long-term industry and market forecasting

- Writing up and presenting project outcomes in the form of analytical or strategic advice

The preferred degrees and courses for this role will differ depending on the industry and the role. Accordingly, while many of the general comments that follow are applicable, the recommended courses (below) may be more relevant to the needs of a pure operations research role.

Preferred degree(s)

A conjoint degree with majors in statistics, computer science (particularly data mining), and commerce (finance or economics) is the preferred path. Engineering is another option, depending on the industry and role. While an undergraduate degree is sufficient for some lower level roles, an honours, and often a masters, is preferred by many organisations. Intelligence and good marks are highly sought after in this area, with some employers seeking graduates with PhDs.

Preferred attributes and skills

- Exceptionally good communication skills; including the ability to listen well, and to present ideas and outcomes clearly and effectively

- In-depth knowledge of the statistical techniques and concepts required to identify which course of action will achieve the desired outcome

- Influential, has presence, is able to think on their feet

- Independent and confident: willing to challenge the status quo, yet flexible and resilient

- Client centred; manages long-term relationships well; enjoys working with people and understanding their problems

- Passionate, receptive, eager to learn

Career pathways that open up (with experience or through promotion)

This career path is initially one of progression, moving from relatively simple to increasingly complex roles on increasingly larger projects. The title shifts from Junior Analyst (or Consultant) to Analyst, then to Senior Analyst or Project Manager.

From this point, promotion can go in a number of different directions. Some graduates stay in analytical roles and become experts in their field. Others move into management – initially as Team Leaders, then Managers, and then into senior executive roles, such as General Manager, Strategy. Others set up their own business, within a similar industry, or work as consultants in their area of expertise. Those with PhDs have the option of choosing an academic career.

Employers' advice to students

"The new wave in consulting is quantitative analysis. So many companies have so much data that they don't do anything with ... There is a gap in the market."

"A stats major gives more depth of understanding to operations management..., a deeper understanding of the operations research methods, how to use them, and why they apply."

"This is a very exciting area – these roles are really valued ... You can be responsible for changing the direction of the company. You make a contribution you can be really proud of."

Recommended Courses in Statistics

Undergraduates

Need to have:	
STATS 125	Probability and its Applications
STATS 255	Introduction to Operations Research
STATS 320	Applied Stochastic Modelling
STATS 325	Stochastic Processes
ENGSCI 391	Optimisation in Operations Research
Nice to have:	
STATS 101	Introduction to Statistics
STATS 201	Data Analysis
STATS 210	Statistical Theory
STATS 220	Data Technologies
STATS 370	Financial Mathematics
STATS 380	Statistical Computing

Postgraduates

Need to have:	
STATS 720	Stochastic Processes
STATS 723	Stochastic Methods in Finance
STATS 724	Operations Research
STATS 726	Time Series
STATS 783	Simulation and Monte Carlo Methods
Nice to have:	
STATS 710	Probability Theory
STATS 730	Statistical Inference
STATS 764	Analysis of Failure Time Data
STATS 780	Statistical Consulting
STATS 782	Statistical Computing
STATS 784	Statistical Data Mining

Operations Research

Kim Frew recently graduated with a Bachelor of Science (Hons) degree and has now completed her masters in the Engineering Science department. Kim was a recipient of the Senior Scholarship in Statistics and the Annual Prize in Statistics. Kim has worked together with Ilze Ziedins, one of the lecturers in the Department of Statistics in creating a simulation model to improve the efficiency of the Cardio-vascular Intensive Care Unit at Auckland City Hospital.

This model has been used to help determine the number of beds needed in the unit, and assist with the planning of surgery schedules and nursing rosters.

Kim Frew, Bachelor of Science (Hons) and winner of the Senior Scholarship in Statistics and Annual Prize in Statistics.

Actuary

An actuary assesses the financial impact of risk and uncertainty. Actuaries evaluate the likelihood of events and quantify their contingent outcomes in order to minimise the losses associated with uncertain, undesirable events. For this reason, more than half the actuaries in NZ are employed by the insurance industry. Others work for the Government, in the Actuary's Office, as quantitative analysts, risk managers, financial managers, general managers, and as investment specialists.

A high level of skill in the use of various statistical techniques is required to assess the risk of certain events occurring and to set premiums that adequately reflect this risk.

Actuary

Actuaries assemble and analyse data to estimate the probability and likely cost of an event occurring, such as death, sickness, injury, disability, or loss of property. In both life and casualty insurance, actuaries calculate premiums and reserves for the policies covered. The premium set must cover the expected losses, expenses, and required profit of an insurance policy. Reserves are the provisions set aside for future payouts.

Actuaries also design and price superannuation plans and other financial assets, and address financial questions, such as how a company should invest resources to maximise its return on investment, for a given level of risk.

A graduate cannot become an actuary until they have met the stringent requirements of the Institute of Actuaries, which takes five to eight years of part-time study. Until this time, they are known as Actuarial Analysts, and are likely to be rotated around different actuarial functions. An analyst working in pricing will undertake the following tasks:

- Data mining and data manipulation

- Data analysis to identify pricing trends

- Converting data to information that enables pricing decisions to be made

- Implementing pricing decisions (feeding pricing data into other relevant systems)

With experience, a graduate will also become involved in:

- Reviewing, choosing and building the pricing models required to carry out this analysis

- Making recommendations regarding pricing

Preferred degree(s)

A major in Statistics or Mathematics is preferred by most employers. While masters papers in Statistics may exempt graduates from one or two of the institute's requirements, employers are equally happy with a bachelors, honours, or masters degree. Their main requirement is high grades, so they can be assured graduates will pass the institute's exams, which are exceptionally tough with a pass rate of only thirty-three percent.

Preferred attributes and skills

- Clarity of thinking; the ability to think through issues to solutions

- Confidence; the ability to pick something up and run with it, and to make decisions and back them up with sound logic and analysis

- The ability to communicate complex issues simply, in business language; including the ability to write clearly and concisely

- Integrity, includes a high degree of accuracy and attention to detail

- The ability to relate easily to people at all levels, and to build and maintain positive relationships

- Persuasive, the ability to influence others

- A keenness to learn and an improvement focus

Career pathways that open up (with experience or through promotion)

Progression occurs from Actuarial Analyst to Senior Actuarial Analyst, to Actuary – when a graduate has passed the Institute's exams, then to Senior Actuary, and Appointed Actuary (this is the highest level that can be attained, there is only one of these per company). Along the way, however, there are opportunities: (i) to move into different functional areas, eg, from product pricing based on real (past) costs, to predicting future pricing, (ii) to take on a team leadership role, and eventually (iii) to move into senior management roles.

Once an actuary has passed their exams, a number of other career paths open up. These include moving into the organisation's Enterprise Risk Management or Strategy teams, into consulting, into investment roles, or into senior financial positions. With confidence, business acuity, and an actuarial qualification a graduate is also exceedingly well placed to take up a role in senior management in any business sector.

Employers' advice to students

"Do a broad range of commerce papers in general business – so you know how the corporate world functions."

"If you can, do summer jobs or internships with a finance company, bank or insurance company."

"A passion for computer programming is a great combination."

"It is not extremely technical. Actuaries are just numerate business people. But it's tough – you must have rare skills – be clever, well-balanced, numerate, work well in a corporate environment, and have the confidence and social skills."

"The key is to demonstrate that you can take on something and do it well."

"There are a lack of experienced people in New Zealand – we have to go overseas to recruit for senior positions."

Recommended Courses in Statistics

Undergraduates

Need to have:	
STATS 108	Statistics for Commerce
STATS 125	Probability and its Applications
STATS 208	Data Analysis for Commerce
STATS 210	Statistical Theory
STATS 310	Statistical Inference
STATS 320	Applied Stochastic Modelling
STATS 325	Stochastic Processes
STATS 370	Financial Mathematics

Nice to have:	
STATS 255	Introduction to Operations Research
STATS 326	Applied Time Series Analysis
STATS 330	Statistical Modelling

Postgraduates

Need to have:	
STATS 710	Probability Theory
STATS 720	Stochastic Processes
STATS 723	Stochastic Methods in Finance
STATS 726	Time Series

Nice to have:	
STATS 705	Topics in Official Statistics
STATS 724	Operations Research.
STATS 730	Statistical Inference
STATS 764	Analysis of Failure Time Data
STATS 782	Statistical Computing

Actuarial Analyst, Sovereign

"Statistics was a natural choice for me. I'm fascinated by the magic of numbers and working with them is like a game. I enjoy using my statistical knowledge and skills to answer practical questions. It's really satisfying to convert mathematical problems into solutions that can be used and understood by anyone.

"My job is actuarial analyst for insurance company Sovereign, working with both the financial reporting and reinsurance teams. The latter involves dealing with large overseas insurance companies to ensure that Sovereign has enough protection against large losses and can always provide cover to its customers.

"All organisations, from private companies to government departments, use statistics in some form, so there are many career opportunities for statistics graduates.
"To succeed in statistics, you should love mathematics (obvious but important!) and see yourself as an office worker, though there are some options in statistics that get you out and about, such as medical or forensic statistics. The good thing about statistics is that it can be applied to almost any field, so you can always double-major in stats and another subject."

Marina Ivanova, Bachelor of Science (Hons), Master of Science.

Biological Sciences

Much of the research conducted in biology (the study of life and living organisms, including their structure, function, growth, origin, evolution, and distribution) and, in particular, ecology (how organisms relate to one another and their environment) require a competence in statistics.

The roles included below tend to either place scientific understanding as the priority, complemented by statistics, as is the case for an Ecologist, or statistics as the higher priority, supported by understanding of the sciences, as is the case for Statisticians and Biometricians.

Both Science graduates and Statisticians are employed in a wide range of scientific organisations, such as Plant & Food Research, Fisheries, AgResearch, Livestock Improvement, the Dairy Board, the Department of Conservation, the National Institute of Water & Atmospheric Research (NIWA), in Universities, Hospitals, the Clinical Trials Unit, and in some larger companies, such as Fonterra.

Bioinformatics

Bioinformatics is the science of collecting, analysing, and linking large collections of complex genetic data. Models are created to replicate biological systems and identify what is going on in a cell or a disease. Bioinformatics leads to the development of new drugs, to drugs tailored to the needs of individuals, to new understandings of embryos, to the development of disease resistant crops, and to new biomarkers (naturally occurring molecules, genes, or characteristics by which a pathological or physiological process, disease, etc. can be identified).

Within a given project, a new graduate is likely to undertake the following statistical tasks:

- Perform exploratory statistics, including boxplots and mean/variance summaries, for large genomic data sets

- Carry out basic quality control processes of genomic data including outlier detection, using agglomerative clustering

- Perform statistical comparisons between groups using linear models

- Understand the issues of multiple testing correction and be able to perform both family-wise corrections and false discovery rate controls

- Undertake a 'reality check' of the statistical results by going back to the raw data to check that the conclusions are biologically sensible

- Present the outcomes of this analysis to non-statisticians

Preferred degree(s)

Bioinformatics occurs at the intersection of Biology, Statistics, and Computer Science and, hence, requires a high level of competence in all three disciplines. In other words, it is recommended that students take all three subjects to stage three level. While a bachelors degree(s) is sufficient, a masters in Statistics will strongly enhance future employability and enable graduates to move from a support role, to one where they are leading projects.

Preferred attributes and skills

- A passion for biology and a love of computing

- A deep understanding of core statistical principles and how they apply in practice

- Competence in the use of (the software) R

- Good communication skills; the ability to listen and define research problems well

- The ability to ask integrative, systems level questions and to make linkages across different areas

- The willingness to initiate, to try something new, and to come up with original ideas and (at higher levels) leading edge projects

Career pathways that open up (with experience or through promotion)

The key to promotion in this area is having the depth of conceptual understanding to make important linkages, the initiative and understanding to identify original concepts and projects, and the ability to listen and communicate well. From a role of learning and being supervised, graduates move in to increasingly more complex project roles and projects, eventually leading their own projects.

Employers' advice to students

"There is a shortage of people with high quality quantitative skills. A good masters will make you infinitely more employable."

"Graduates [with a masters] are in huge demand."

Recommended Courses in Statistics

Undergraduates

Need to have:	
STATS 101	Introduction to Statistics
STATS 201	Data Analysis
STATS 210	Statistical Theory
STATS 220	Data Technologies
STATS 302	Applied Multivariate Analysis
STATS 330	Statistical Modelling
STATS 340	Design and Analysis of Surveys and Experiments
Nice to have:	
STATS 125	Probability and its Applications
STATS 331	Introduction to Bayesian Statistics
STATS 380	Statistical Computing

Postgraduates

Need to have:	
STATS 730	Statistical Inference
STATS 766	Multivariate Analysis
STATS 771	Topics in Biostatistics (= BIOSCI 744 Advanced Bioinformatics)
STATS 779	Professional Skills for Statisticians (or STATS 782 Statistical Computing)
Nice to have:	
STATS 731	Bayesian Inference
STATS 783	Simulation and Monte Carlo Methods
STATS 784	Statistical Data Mining

Ecologist

Ecologists study how living organisms interact with each other and their environment. They may study individual organisms, populations, species, or entire communities or ecosystems. Ecologists may also be involved in the control of populations and in the management and conservation of habitats.

The tasks a technician is likely to undertake, include:

- Provide input into project planning

- Perform standard experiments or run models according to standardised procedures

- Collect and process data from fieldwork, experiments, equipment, or samples

- Maintain data quality and assist with data management and archiving

- Analyse data

- Design and implement statistical models or programming packages to test variables

- Assist with the preparation of research reports, papers, and presentations

- Lead small projects and field programmes

Preferred degree(s)

While a BSc with a major in Ecology, supported by complementary papers in Statistics, is sufficient for some roles, a masters is considered entry level by many organisations, such as Fisheries or NIWA. If the student's aim is to become a Scientist, rather a Technician, a PhD in Ecology with a masters in Statistics is strongly preferred.

Preferred attributes and skills

- The ability to think critically and in a structured way while working through projects; a positive approach to problem solving

- A passion for ecology

- The ability to convey ideas clearly and concisely, both orally and in writing

- A mind that is curious, an enjoyment of learning; a model of the world that recognises there is still much to know and understand

- Self-motivated and open, willing to identify and use new techniques

- Relates well to others; including being a good team-worker and having the potential to coach and/or lead others

Career pathways that open up (with experience or through promotion)

Typically, there are two key career stages, Technician and Scientist. In general, graduates will only progress from one to the other if they have a PhD. A small percentage move into management roles, while those at the very top of their game may be promoted to Chief Scientist or Principal Scientist.

Employers' advice to students

"Develop your numerical skills. Be as numerically strong as you can."

"If you have stage three statistics, you will be streets ahead – much more able to design and produce valid results."

"You need stats to do ecology, but students don't recognise this."

"Stats leads to so many different opportunities. If you just do biology or ecology, the range of opportunities is much more limited."

"Good people with good quantitative skills are hard to come by."

Recommended Courses in Statistics

Undergraduates

Need to have:	
STATS 101	Introduction to Statistics
STATS 201	Data Analysis
STATS 210	Statistical Theory
STATS 302	Applied Multivariate Analysis
STATS 330	Statistical Modelling
STATS 340	Design and Analysis of Surveys and Experiments
Nice to have:	
STATS 125	Probability and its Applications
STATS 220	Data Technologies
STATS 331	Introduction to Bayesian Statistics

Postgraduates

Need to have:	
STATS 731	Bayesian Inference
STATS 732	Topics in Statistical Inference
STATS 761	Mixed Models
Nice to have:	
STATS 730	Statistical Inference
STATS 766	Multivariate Analysis
STATS 771	Topics in Biostatistics (equivalent to BIOSCI 744 Advanced Bioinformatics)
STATS 779	Professional Skills for Statisticians
STATS 783	Simulation and Monte Carlo Methods

Biometrician at The New Zealand Institute for Plant and Food Research Ltd

"I provide data analysis for the Plant and Food Scientists at The New Zealand Institute for Plant and Food Research. This involves designing statistical experiments for research, analysing and interpreting the data, summarising the results and making suggestions to the scientists based on my findings. Plant and Food are involved in ground-breaking scientific research, and they have a real need for people with scientific data analyst skills.

"The Statistics department at The University of Auckland is the largest in Australasia, has a huge variety of courses to choose from, is a great study environment and provides excellent facilities for students."

Sammie Jia, Bachelor of Science with First Class Honours in Statistics.

Statistician or Biometrician

The role of a Statistician or Biometrician is to support the research projects undertaken by Scientists. This is similar to a consulting role, where the Statistician's main function is to collaborate with a Scientist, providing expert statistical advice and input on the experiments and surveys being conducted.

The key tasks a Statistician is likely to undertake, include:

- Developing an accurate understanding of the Scientists' research needs

- Designing the statistical methodology to be used, and educating others on its efficacy

- Designing and managing the data base in order to maintain data integrity

- Analysing and interpreting the outputs of experiments and surveys

- Developing and validating predictive models

- Reporting on and presenting results

Preferred degree(s)

This depends on the organisation and the nature of the role, however, most require a good Masters or a PhD in Statistics. For some employers, this would ideally be supported by an undergraduate degree in the area of science being studied.

Preferred attributes and skills

To succeed in this area, graduates require a high level of academic understanding plus very good people skills. This is due to the nature of the role, being one of collaborating with, and consulting to, others. Accordingly, the key attributes needed, include:

- The ability to relate well to others and to work well as part of a team

- A client focus, including listening and responding to the needs of others

- A deep understanding of the theoretical constructs underpinning the statistics, allowing for the consideration of a wide range of methodologies and technologies in the design process

- A clear understanding of the scientific issues being researched

- The ability to communicate complex ideas simply and effectively, and in language lay people can understand

- Curious

- Self-motivated

Career pathways that open up (with experience or through promotion)

A graduate with a masters will initially work on relatively simple projects with support and guidance from others. As experience and understanding builds, they will begin to work independently, on increasingly complex projects. As they continue to grow in the role, Statisticians begin to work more closely with scientists, until they are a core part of the science team.

With a PhD, graduates are likely to be involved in all facets of a project, from beginning to end, ultimately co-authoring scientific publications. They are also likely to supervise and support others.

While progression within an area is more common than promotion (to new and different positions, or to managing or leading others in this work), the statistical skills involved are highly transferable, allowing graduates to work in a wide variety of industries, or to move into statistical consulting roles.

Employers' advice to students

"More and more data is being produced – those that can deal with this are becoming very highly sought after."

"Statistics opens the door to so many different things. [These are] very specialist skills that are widely transferable to different areas – it gives you the freedom to move around – and huge variety."

"You'll be working with internationally recognised scientists – working at the edge"

"Statistics strengthens their hand - it provides opportunities to do interesting and exciting things."

Recommended Courses in Statistics

Undergraduates

Need to have:	
STATS 101	Introduction to Statistics
STATS 201	Data Analysis
STATS 210	Statistical Theory
STATS 330	Statistical Modelling
STATS 340	Design and Analysis of Surveys and Experiments
Nice to have:	
STATS 125	Probability and its Applications
STATS 220	Data Technologies
STATS 301	Statistical Programming and Modelling using SAS
STATS 302	Applied Multivariate Analysis
STATS 310	Introduction to Statistical Inference
STATS 380	Statistical Computing

Postgraduates

Need to have:	
STATS 779	Professional Skills for Statisticians
STATS 780	Statistical Consulting
Nice to have:	
STATS 731	Bayesian Inference
STATS 771	Topics in Biostatistics (= BIOSCI 744 Advanced Bioinformatics)
STATS 750	Experimental Design
STATS 761	Mixed models
STATS 766	Multivariate Analysis

Medical Statistics

Medical Statistics, or Biostatistics, is the study of human health and disease, with applications ranging from biomedical laboratory research, to clinical medicine, to health promotion, to national and global systems of health care. Medical statisticians design and analyse studies to identify the real causes of health issues – as distinct from chance variation.

Medical Statistician

Medical Statisticians typically work in collaboration with Scientists and Physicians. They may work in academic institutions, in hospitals, in the pharmaceutical and biotech industries, or in the government organisations that fund and provide health care.

The key tasks a Medical Statistician is likely to undertake, include:

- Meeting with medical researchers to identify and understand their needs
- Selecting an appropriate study design to address the medical questions being researched
- Selecting and applying appropriate statistical techniques for analysing medical data
- Analysing and managing statistical data using a range of software packages
- Interpreting results
- Writing up the results and presenting them to the medical community
- Keeping up-to-date with new developments in medical statistics

Preferred degree(s)

This depends on the level of work to be undertaken. If the student wants to be a Data Analyst or a Statistics Technician, involved in the organisation and cleaning of data, then a good bachelor's degree, majoring in Statistics, is sufficient.

If the aim is to be intimately involved in research design, planning, and execution, as well as analysing data and writing this up, then a Masters in Statistics is required.

If, however, the aim is to direct research, and to potentially move into a management role or work in academia, then a PhD is necessary. For example, a PhD in Cardiological Research.

In addition to Statistics, taking courses in the health sciences, such as Anatomy, Physiology, Epidemiology, or Genetics is a strong bonus – with some employers preferring a conjoint bachelors degree in Statistics and the relevant area within health sciences.

Preferred attributes and skills

- A deep understanding of research processes, including an understanding of the shades of grey that exist and, hence, the ability to identify the best way to proceed after considering various alternatives
- A consultative approach, including an openness and willingness to discuss the pros and cons of the various research options
- The ability to communicate and educate health professionals on the significant statistical concepts involved in study design
- A sharp mind – the ability to provide clear and comprehensive advice
- A pragmatist
- Self-aware, the ability to critique one's own work and learn from this
- A self-starter

If graduates are interested in undertaking or leading research projects in an academic institution or hospital, previous experience is essential, eg, in a clinical trials unit or a pharmaceuticals company.

Career pathways that open up (with experience or through promotion)

The career opportunities that open up reflect the level of research being undertaken. At the higher levels, the career steps are similar to those in academia, in other words a graduate will start off as a Research Fellow, then move to the position of Senior Research Fellow, then to Associate Professor. Opportunities also exist to move into consulting roles.

Employers' advice to students

"Gain as wide experience as possible. Try and get a summer scholarship while at university. Try out the research environment – even if voluntary."

"Is helpful to understand the basic concepts of anatomy and physiology."

Recommended Courses in Statistics

Undergraduates

Need to have:	
STATS 101	Introduction to Statistics
STATS 201	Data Analysis
STATS 210	Statistical Theory
STATS 301	Statistical Programming and Modelling using SAS
STATS 310	Introduction to Statistical Inference
STATS 330	Statistical Modelling
STATS 340	Design and Analysis of Surveys and Experiments

Nice to have:	
STATS 125	Probability and its Applications
STATS 207	Data-centred Investigation and Analysis
STATS 302	Applied Multivariate Analysis

Postgraduates

Need to have:	
STATS 761	Mixed Models
STATS 770	Introduction to Medical Statistics
STATS 773	Design and Analysis of Clinical Trials
STATS 779	Professional Skills for Statisticians
STATS 780	Statistical Consulting
STATS 788	Dissertation in Medical Statistics

Nice to have:	
STATS 740	Sample Surveys
STATS 782	Statistical Computing (may be taken instead of STATS 779)

Also required: POPHLTH 708 Epidemiology or POPHLTH 709 Clinical Epidemiology and Evidence-based Health Care. In some roles, a significantly greater understanding of Anatomy, Physiology, Epidemiology, or Genetics is preferred. In these cases, students may want to consider undertaking a conjoint degree.

Industrial/Organisational Psychology

Industrial or Organisational Psychology is the scientific study of employee behaviours and attitudes. Research is used to design effective hiring processes, training programmes, and feedback systems. It is also used to improve employee engagement. Statistics is essential to designing and running the assessment tools used in this work.

Organisational Psychologist

Organisational psychologists are involved in assessing the suitability of candidates for particular roles using psychometric testing. They are also involved in designing projects, analysing outcomes, and writing reports on employee engagement and employee performance, including related aspects of employee development.

The key tasks a graduate is likely to undertake (initially in a support role), include:

- Meet with clients to identify their needs

- Design a solution to meet the need. This may include:

- Undertaking a Job Analysis for a vacant position

- Running focus groups to identify if the right people are in the right positions

- Building an assessment tool

- Statistical modelling to assess and measure constructs that are difficult to measure, such as personality traits

- Run the assessment tool, eg, the psychometric test or engagement survey

- Analyse and write up the results

- Discuss the applicant's style with the client and the applicant; or present the survey results to the client

- Validate the assessment tool to check the survey/test outcomes correlate with performance, and identify those variables that most closely predict performance

Preferred degree(s)

A master in Psychology (including the Research Methods and Industrial/Organisational Psychology papers). A minor in Statistics is a bonus.

Preferred attributes and skills

- The ability to interact effectively with clients and build rapport

- The ability to communicate complex psychological concepts simply

- Being self-motivated, having a drive for results and a thirst for knowledge and learning

- Intellectual ability

- Attention to detail and follow-through

Career pathways that open up (with experience or through promotion)

The keys to promotion in this area include the ability to interact effectively with clients, the ability to sell projects, skill in leading and coaching others, strengths in solution development, and a clear demonstration of expert knowledge in the relevant area.

As an employee grows in the role, they work on increasingly complex and larger projects, with greater client interface. The role shifts from one of learning, to managing small projects to managing larger more complex projects, including leading and coaching others. During this time the title shifts from Junior or Support Consultant, to Consultant, to Senior Consultant.

Other career pathways that open up include moving into a Human Resources role within a larger company, working in Workforce Analytics (a growing area), travelling offshore to work as an Assessment Developer in R&D, setting up a company providing specialist support and advice, or working for a survey provider in another industry, eg, market research.

Employers' advice to students

"If you have the skill, pick up some IT papers, as computer scenarios are increasingly being used in place of the standard agree/disagree tests."

"Embrace statistics – it is so valuable... Feel the fear and do it anyway.... When you have statistics, you get real confidence that you will make a difference."

"Do what you enjoy. Understand your strengths. [Then] match these together."

"Be open to different things, Try things out."

Recommended Courses in Statistics

Need to have:	
STATS 101	Introduction to Statistics
STATS 201	Data Analysis
STATS 340	Design and Analysis of Surveys and Experiments
Nice to have:	
STATS 302	Applied Multivariate Analysis
STATS 330	Statistical Modelling
STATS 331	Introduction to Bayesian Analysis

If a student is interested in adding further papers in statistics, they could consider: STATS 150 Lies, Damned Lies and Statistics, STATS 220 Data Technologies, and STATS 326 Applied Time Series Analysis.

Education

Statistics is now a separate subject at senior levels in New Zealand's secondary school system. Accordingly, graduates who are intending to teach mathematics in years twelve and thirteen are now required to take stage three Statistics.

Teacher, Senior School

The word education is derived from the Latin educere, which means to both 'lead' and to 'bring forth that which is within'. Thus the role of a teacher is to transmit the knowledge and skills necessary to enable students to be contributing members of society, and to bring out the potential of each individual student as they grow into adults.

Senior School Teachers teach years twelve and thirteen at Secondary School. The generic tasks a teacher performs, include:

- Planning lessons and preparing resources

- Presenting lessons: developing students' understanding and skills in the subject

- Writing and marking tests and assignments

- Writing reports

- Attending curriculum and administrative meetings

- Attending to the pastoral care needs of students, ie, their social and behavioural needs, and the disciplining of students

Preferred degree(s)

The preferred degree reflects the aims and intentions of each student.

While students are only required to have one stage three paper in the subjects they want to teach to register as a teacher, the New Zealand Teachers Council currently requires two stage three papers – and is considering requiring a postgraduate qualification in the future. Thus, students are strongly recommended to take two stage three papers in Statistics if they wish to teach it at senior levels.

If a student's aim is to teach at a polytech, then a minimum of a PGDipSci is required, either in Statistics or in Statistics and Maths Education. If their aim is to stay in the school system and move up the ranks to Deputy Principal and Principal, then a Master in Education Administration is recommended. Finally, if the goal is to train students to teach Statistics at a university, then a PhD is required.

Preferred attributes and skills

- People skills: relates quickly and easily to young people; includes having an involvement with, interest in, and understanding of, children and teenagers

- Social confidence, willing to speak up, to talk in front of others

- Listens actively, is observant

- Out-going, enthusiastic

- An independent flexible thinker

- Has a strong learning orientation, eg, is willing to relearn material for the purposes of helping others learn and understand

- Good English language skills, including the ability to write reports

Career pathways that open up (with experience or through promotion)

As graduates progress through the school system, a number of options open up, including becoming the Deputy Head of Department in their specialist subject area, followed by Head of Department. Alternatively, they may be interested in moving into a pastoral care role as a Dean, or into a specialist teaching role.

With the requisite skills, they may be considered for one of the four key management roles that exist in most schools, the first three as Deputy Principals, including: (i) DP Curriculum, (ii) DP Pastoral Care, and (iii) DP School Management. If they have high level people and organisational management skills, they may also be considered for the role of Principal.

Other options include teaching at a polytechnic (if the graduate has a PGDipSci or masters), at a University, if they have a PhD, or teaching overseas, as the qualification is highly versatile, enabling graduates to teach anywhere in the world. They may also consider moving into a training and development role in a large organisation or corporate.

Employers' advice to students

"Do some psychology – it teaches you about people ... [and gives you] the ability to analyse children's difficulties."

Recommended Courses in Statistics

Undergraduates

Need to have:	
STATS 101	Introduction to Statistics
STATS 150	Lies, Damned Lies and Statistics
STATS 201	Data Analysis
STATS 302	Applied Multivariate Analysis
STATS 330	Statistical Modelling
STATS 340	Design and Analysis of Surveys and Experiments
Nice to have:	
STATS 125	Probability and its Applications
STATS 210	Statistical Theory
STATS 301	Statistical Programming and Modelling using SAS

Postgraduates

Need to have:	
STATS 708	Topics in Statistics Education
Nice to have:	
STATS 780	Statistical Consulting

A postgraduate student can choose any papers, based on their area of interest, however STATS 708 is strongly recommended. Depending on the course being taken, this may be supplemented by either a research methods paper, a thesis in Statistics, or a thesis in Statistics Education.

Mathematics and Statistics Teacher in Ghana

"I currently work as a mathematics and statistics teacher at an international school in Ghana, West Africa. Previously, I was teaching at Auckland Girls Grammar School. I tell the students that statistics is an important part of many jobs, and that in both our personal and professional lives, it's really important to be able to critically examine the statistics behind the 'facts' we hear.

"What I really enjoy about statistics is its relevance and usefulness to us all, whether that's determining the efficiency of new drugs or identifying new social trends.

"I always encourage my students to further their study of statistics at tertiary level, as a second major or minor. It helps keep their career options open and it provides them with a distinct advantage in a competitive job market."

Shan-I Lee, Bachelor of Science and Bachelor of Education.

Government

The Government employs a wide range of people with statistical skills in a wide variety of roles. The following focuses firstly on policy development roles in government ministries. It then looks at two completely different roles in other areas, to provide an example of the type and range of positions available in the government sector.

A Ministry is the government's lead advisor in its sector, shaping direction and delivering policies and services that reflect its leadership role in that sector. This includes implementing strategic and operational policies, undertaking research to measure and evaluate the capability, viability, and success of the sector, and managing resource allocation across the sector. Each ministry also coordinates work with other sector and government agencies, and forums to achieve shared goals through cross-sector work programmes, contributes to broader government goals, and provides ministerial support to assist the Minister and Associate Minister to meet their obligations to Parliament.

The first two examples, below, Analyst and Research Analyst, give an overview of the policy development roles within each ministry. The remaining two roles, Intelligence Analyst and Financial Forecasting and Modelling Analyst, give examples of other roles that exist within government that may also be of interest to graduates with strong quantitative skills.

Analyst

This role works within a team that analyses and interprets the state of the sector. The team's work informs the development of policy and monitors the performance of the sector to determine whether it is meeting the government's strategic priorities.

While good numeracy skills are important, what is more important is the ability to think deeply and critically about the questions being asked, and to clearly identify the policy implications contained within the numbers and the mathematical models developed. What is essential, is to write about the maths in such a way that a lay person can clearly understand the policy implications contained within the research.

The key tasks involved initially, ie, as an Assistant Analyst, include:

- Liaising with internal clients, interpreting their needs and identifying the real problems they're trying to solve, or questions they're trying to answer

- Contributing to the development and management of data collection processes

- Data cleaning and tidying

- Manipulating data to ensure its accuracy, adjusting for the ways in which different factors affect the data and data outcomes

- Analysing the data, including interpreting the information obtained from a political or policy perspective

- Assisting with writing up the outcomes of the analysis

Preferred degree(s)

An honours or masters degree is preferred, with a minor in Statistics or Mathematics. Some managers have little preference regarding subject area. Others prefer a masters in subjects such as Social Policy, Sociology, Psychology, Economics, or Geography, supported by advanced statistical and quantitative analytical skills.

Preferred attributes and skills

- The ability to write clearly and present the maths in plain English, so lay people can understand the policy implications contained within the analyses

- The ability to look at a problem broadly and to think about the question critically

- A passion for research that delivers meaningful and valid answers; the willingness to really put in the effort, "50% is not enough, 100% is needed"

- Good verbal communication and relationship management skills

- The ability to work in a political context, including patience, understanding, and the willingness to compromise

- A willingness to learn, to enquire and adapt, to take an exploratory approach, rather than to head down a single track

One employer summed up these attributes, as follows: "The combination of good marks, being socially capable, and being able to listen is so powerful."

Career pathways that open up (with experience or through promotion)

Progression is from Assistant Analyst, to Analyst, to Senior Analyst, with each level requiring deeper and more insightful analysis and increased autonomy. Senior Analysts manage their own projects and coach others with less experience.

From there, a number of options open up. For many, staying in an analytical role is their career of choice, in which case, they may remain in the role of Analyst or Senior Analyst in the same or another Ministry. Alternatively, they may become a specialist in their particular area of expertise. If a person is particularly strong analytically, they may be promoted into the role of Principal Analyst, then Chief Analyst – a key strategic role within the Ministry.

Those who have good management and organisational skills may be promoted into team leadership roles and, from there, into management roles. Others may move to other Ministries, to research agencies, or travel overseas, as this skill set is highly transferable.

Employers' advice to students

"Keep your options open – do a range of subjects, including things you enjoy and things you are interested in. It is less important what your degree is in – it shows aptitude and the willingness to apply yourself."

"Know there is work ahead before you will get into a great job. The key is proving yourself."

"Do a broad bachelors degree – don't go too narrow in the early stages. The public sector is changing rapidly, so needs broad skills."

"Do statistics - the higher the better. The opportunities are stronger with stage two or stage three – there are more choices in the jobs you can apply for, [it] helps you stand out when you apply."

Research Analyst

A Research Analyst undertakes analytical projects that provide high quality analytical advice to support the Ministry's policy and operational functions. This includes: (i) providing research and evaluation consultancy services to Ministry staff, (ii) providing guidance, advice and support on the evaluation methods used and the research outcomes achieved, (iii) leading and co-ordinating strategic research that supports the Ministry's medium-term priorities, and (iv) undertaking projects that require specialist analytical management and support.

Key tasks involved at graduate level – as an Assistant Research Analyst – include:

- Collecting data

- Creating systems to manage and link the data

- Using and processing data; developing and using systems to push the data out to others

- Manipulating and analysing data, including running quality checks on it, and working with extracting relevant information for policy and operational purposes from the data

- Developing statistical models that enable forecasts of likely future outcomes in key policy areas to be developed

- Writing up the outcomes of this analysis

- Once they progress into the role of Research Analyst, their key accountabilities become:

- Analysing past and future trends in the sector

- Assisting in the development of analytical frameworks, processes, and quantitative models to describe the factors that influence sector outcomes

- Examining results from a variety of perspectives, including their policy, operational and political implications, and communicating the relevant issues and outcomes

- Providing guidance to policy and operational units on data/research interpretation

- Providing advice based on a deep knowledge of the sector and its issues

- Taking responsibility for maintaining databases and reporting systems

- Writing and presenting reports on research outcomes

- Establishing and maintaining strong working relationships with staff and clients

Preferred degree(s)

An honours or masters degree in a quantitative discipline such as Statistics, Mathematics, Operations Research, or Computer Science is preferred.

Preferred attributes and skills

- Highly developed problem solving and strategic thinking capabilities, includes the capacity to work within an interdisciplinary perspective

- Initiative, being resourceful, having a results orientation

- High quality verbal and written communication skills

- Experience in using SAS, and advanced Excel skills

- Good relationship management skills, including working well in a team

Career pathways that open up (with experience or through promotion)

Progression occurs from Assistant Research Analyst to Research Analyst, to Senior Research Analyst. This reflects the shift from undertaking routine analytical tasks, to working on more complex tasks and projects, to developing the different methodological responses used.

People often choose to stay in one of these roles. Alternatively, they may be promoted to Principal Analyst, or move into team leadership and management roles. They may also move to other government departments, or quasi government agencies, to private sector research organisations, or into teaching or lecturing (if they have a PhD).

Employers' advice to students

"There are a huge range of opportunities [for statisticians] throughout government ... they can do everything. The world's their oyster. This is not an area that is standing still – it is moving at a speed people have to catch up with. It's fun, exciting."

Intelligence Analyst, Inland Revenue Department

Statistics graduates tend to start their career with the IRD in either Computer Forensics, Profiling and Analytics, or Intelligence. An Intelligence Analyst is responsible for delivering high quality, timely and integrated data analysis and intelligence to ensure robust scientific and quantitative analysis underpins the decision-making behind risk targeting, case selection, and risk response.

The following example is taken from the Customer Compliance team. In this case, a graduate will enter the organisation as a Compliance Support Officer and progress into the role of an Intelligence Analyst, which has the following accountabilities:

- Acquires data and intelligence; manages and coordinates local intelligence gathering processes, includes identifying and resolving data integrity issues

- Analyses data and intelligence to better understand customer compliance behaviour and any risks this poses for the tax base.

- Interrogates data and undertakes comprehensive quantitative analyses of risk indicators, patterns, behaviours, practices and environmental influences.

- Identifies and reports on non-compliance trends and patterns that assist in the evaluation and prioritisation of risks

- Assists in the design, development, and maintenance of intelligence and risk analysis systems, tools and processes

- Prepares and presents reports and recommendations on non-compliance trends and patterns, and the evaluation and prioritisation of risk

Preferred degree(s)

A bachelors degree is required, with a major in Statistics, Risk Management, Economics, Accounting, Mathematics, or Operations Research.

Preferred attributes and skills

The key attributes sought by the IRD include: good critical thinking and analytical skills, the ability to construct strong arguments, to influence, to work collaboratively, be self-managing, flexible, willing to learn, and have a good understanding of business.

Financial Forecasting and Modelling Analyst, Ministry of Education

This role forecasts and monitors education expenditure, models the operation of education programmes in order to advise policy makers on the impact of policy initiatives, and maintains and disseminates information on education resourcing.

The key tasks involved, include:

- Develops and maintains forecasts of expenditure on government education programmes

- Initiates and undertakes research into factors affecting education expenditure

- Maintains and develops databases to support the unit's forecasting and monitoring activity

- Develops models and methodologies for assessing the impact of policy initiatives, particularly in financial terms

- Advises clients on the use of models and the risk sensitivity associated with results

- Documents outcomes in a way that is easy for others to access and understand

Preferred degree(s)

A bachelors degree is the minimum required, with a postgraduate degree in a quantitative discipline preferred. This should include expertise in financial and statistical data analysis, database management, forecasting, and statistical modelling techniques.

Preferred attributes and skills

Good problem solving and strategic thinking skills, a results orientation, good communication and relationship management skills, and experience in the use of SAS and Excel.

Recommended Courses in Statistics

Undergraduates

Please Note: The nature of the roles and the variety of areas covered within government make it impossible to identify a group of papers that will suit the needs of all students. Accordingly, the following is provided as a starting place only.

Need to have:	
STATS 101	Introduction to Statistics
STATS 201	Data Analysis
STATS 210	Statistical Theory
STATS 301	Statistical Programming and Modelling using SAS
STATS 330	Statistical Modelling
STATS 340	Design and Analysis of Surveys and Experiments
Nice to have:	
STATS 220	Data Technologies
STATS 302	Applied Multivariate Analysis
STATS 326	Time Series

Postgraduates

Need to have:	
STATS 705	Topics in Official Statistics
STATS 740	Sample Surveys
STATS 780	Statistical Consulting
Nice to have:	
STATS 766	Multivariate Analysis
STATS 779	Professional Skills for Statisticians
STATS 784	Statistical Data Mining

Local Government

As with other local government bodies, the role of Auckland Council is to promote the social, economic, environmental and cultural well-being of the city. To this end, it assesses and makes decisions on the existing and future use of land, the location of critical infrastructure, and oversees nationally and regionally significant areas. It also identifies and sets growth priorities, and determines the policies, priorities, programmes, and land allocations required to implement the city's strategic direction, including how to best allocate resources to achieve this.

A range of roles exist for graduates with strong statistical and quantitative skills in a wide variety of areas in local government. This includes roles in business analysis, operations research, finance, economics, policy development, scientific research, and the social sciences.

NB: Given the breadth of subject areas and roles that exist within local government, it is impossible to provide a definitive description of the preferred degree(s), attributes, and courses a student should take if they are interested in working for local government.

For this reason, these students are recommended to (i) review that subject area and role that most closely fits their chosen career path throughout the rest of this document, and (ii) contact their local council to identify the requirements and opportunities relevant to their particular career path.

Energy

The energy sector comprises electricity, oil, gas, and coal, although the following focuses primarily on electricity generation. Generation is the first stage of a process that provides electricity to consumers. The other stages include: (i) transmission; the bulk transfer of electricity from power plants to substations, (ii) distribution; delivery from substations to consumers, and (iii) electricity storage and recovery.

Engineering graduates are by far the largest group of graduates employed in electricity generation and, while they utilise statistics, it is a minor component of their role. The following, therefore, provides an example of the type of role in which statistics plays a more significant part.

Wholesale Markets Analyst

An analyst, such as a Wholesale Markets Analyst or Portfolio Analyst, contributes to the development of strategies that minimise a company's risk and maximise its energy or revenue portfolio. This entails running complex optimisation models, valuing and pricing wholesale deals and options, undertaking transmission analysis, and reporting on outputs – turning complex market information and model results into a common language that a lay person can understand.

Analysts are highly numerate, and comfortable investigating and manipulating data, and interpreting and presenting the patterns and relationships it contains, in a form that is useful and meaningful to management.

The types of tasks an Analyst will undertake, include:

- Forecasting demand for electricity

- Collecting, monitoring, interpreting, and reporting on data; identifying trends and the drivers behind changes in trends

- Analysing the impact of a transmission line or generator outage on the market, or the cost to the business of taking a unit or station out for maintenance

- Conducting what-if analyses, and analysing historical data, to better understand the future

- Conducting analyses to maximise hydro efficiency

- Developing and maintaining energy margin budgets

- Building and supporting spread sheeting tools

- Trading on the futures market

Preferred degree(s)

Energy companies differ on their degree requirements. Some state a good bachelors degree is sufficient while others prefer graduates to have an honours degree. The preferred major is in Mathematical Modelling and/or Statistics, supported by papers in subjects such as Operations Research, Finance, Economics, Portfolio Management, Physics, or Engineering.

Preferred attributes and skills

- Excellent analytical skills – the ability to draw out what is meaningful from the numbers

- The ability to relate easily to others; good social skills

- The ability to communicate complex ideas simply and in language lay people will understand

- Confidence, the willingness to put ideas and solutions forward and the skill to influence others

- An innovative response to the questions and problems being analysed

- A focus on continuous learning

Career pathways that open up (with experience or through promotion)

Initially progression is likely to be from Analyst to Senior Analyst to Team Leader, if the graduate has good people management skills, the ability to influence others, and a high level of analytical skill.

Other career paths include working in Risk Analytics, Investment Analytics, Sales Analytics, Portfolio Management, or Strategic Analysis – or moving into other departments, such as Marketing, Finance, or Engineering. With the right skills, a graduate can also move into senior management roles in Analytics, Trading, or Strategy.

Employers' advice to students

"It's the quantitative skills that make you stand out; having maths really separates people."

"Take any opportunity to do a summer internship – in a company you are interested in – get work experience if you can."

"Know what interests you, what drives you – and choose an industry you feel passionate about."

"As a graduate, your degree [marks] get you in the door. After that it becomes less important. The key is how you relate to others, and how you handle the role."

"Make sure people know who you are and what you do. Get involved in cross-over projects with other departments. It's about who you know. Just doing good work is not enough."

"While it's ideal to have maths or stats to stage three, don't only do stats and maths, do it with finance or economics."

Recommended Courses in Statistics

Undergraduates

Need to have:	
STATS 101	Introduction to Statistics
STATS 201	Data Analysis
Nice to have:	
STATS 210	Statistical Theory
STATS 220	Data Technologies
STATS 255	Introduction to Operations Research
STATS 302	Applied Multivariate Analysis
STATS 320	Applied Stochastic Modelling
STATS 326	Applied Time Series Analysis
STATS 370	Financial Mathematics

Postgraduates

Nice to have:	
STATS 726	Time Series
STATS 766	Multivariate Analysis

Wind Industry

"With our environment currently under threat from issues such as climate change and global warming, we can no longer afford to ignore how our day-to-day lives contribute to these problems. In searching relevant areas of research in which I could combine my interest and academic direction, the Wind Project jumped out. By studying the statistics behind The New Zealand Wind Industry, in relation to economics, environmental impact, and power generated, we can gain a better understanding of how to make wind generated power a viable option for the future, both environmentally and economically.

"The facilities at The University of Auckland are fantastic and the lecturers make a real effort to build relationships with their students. They have given me the skills and confidence to carry on with my research when I graduate and make my mark on the world."

Ke (Kim) Nan, PhD student in Statistics.

Engineering – Product Design and Development

In a simple world, there are only five steps between developing an idea for a product and getting it to the end consumer. These are:

- Designing the product

- Designing the equipment and processes used in production

- Producing the product to the quality and specifications required

- Storing the product

- Transporting the product to the consumer

Skills in engineering design and development are required at each of the first three stages, for which only stage one statistics or similar, is required. A number of related functions, however, can be achieved more easily and more effectively, with a higher level of statistics. These include quality control, yield assessments, monitoring the effectiveness of changes to processes, testing tolerances, testing products for variation and reliability, and trialling products.

Product Development Engineer

As a new graduate, a Product Development Engineer supports product development processes and continuous improvement projects, initially under supervision as they develop industry specific knowledge and experience. The key tasks undertaken at this level, include:

- Producing design concepts, drawings, and documentation for product components and processes

- Developing models and prototypes to support product development

- Testing, validating, and documenting the design of product and processes

- Supporting continuous improvement activities for existing products and processes; including establishing the root causes of problems, testing solutions, and demonstrating improvements

Preferred degree(s)

The preferred degree is a Bachelor of Engineering, with the preferred major reflecting the nature of the product being developed. Taking statistics to stage two or stage three is considered a 'nice to have', rather than a necessity, and enables graduates to solve problems and develop solutions more effectively and efficiently.

Preferred attributes and skills

- Having an achievement orientation, being driven; getting things done

- Analytical thinking skills, the ability to see what is happening below the surface

- Conceptual thinking skills; coming up with ideas – being creative and innovative

- Understanding the commercial realities associated with product development

- Showing initiative, being keen, motivated

- Self confident and influential

- Having a passion for the product and field of work

Career pathways that open up (with experience or through promotion)

Different companies have different lines of progression. One example is Production Development Engineer Level One, to Production Development Engineer Level Two, to Senior Production Engineer and Senior Engineering Specialist. Additional options include moving into other product areas or other engineering roles, for example, Operations Engineer, or Process Development Engineer. If a candidate has strong project management skills, understands the regulatory environment, and is good with people, they may be promoted to Project Leader, or Product Development Manager Level One and then in to more senior management positions.

Employers' advice to students

"Anyone working in product development needs some statistical knowledge – if they don't have that, they are severely impaired. The reason for this, is our customers' high expectations in terms of quality and reliability. It's no longer okay to design a product that's okay almost all the time. It must be not okay almost never."

"You must love what you do, have a passion for what you do."

"Try things, broaden your horizons – don't limit yourself to just, say, mechanical engineering. If you can branch out, do other stuff, do it – stats would be an example."

Recommended Courses in Statistics

Undergraduates

The statistics papers taken by students should reflect their interests, their career intentions and the branch of engineering they are undertaking. Accordingly, the following is provided as a starting place only:

Nice to have:	
STATS 210	Statistical Theory
STATS 302	Applied Multivariate Analysis
STATS 340	Design and Analysis of Surveys and Experiments

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