

Te whai hua - kia ora!

sorted
in Schools

Statistical Inference

SORTED THEMES

KiwiSaver, Retirement, Managing my Money

LEVEL

2

CREDITS

4

AS91264 (version 3)

Economic Theory and Practice

Use statistical methods to make an inference

Te whai i ngā tikanga o te tūhuratanga tauanga hei whakaputa hīkaro

Nau mai haere mai!

Welcome to the Statistical Inference module.

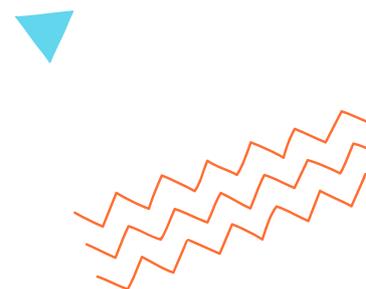
This module is part of a series of NCEA learning materials available from Sorted in Schools - Te whai hua - kia ora!

The other documents in the module are:

- **A student booklet** that supports you to develop the skills, knowledge, and understanding that you need to meet the requirements of an NCEA achievement standard.
- **A practice booklet** that provides opportunities for you to apply and consolidate your learning.
- **An answer booklet** to accompany the practice booklet.
- **A vocabulary list** of key terms.

Each booklet is provided as a Word document and PDF to use online or printed. When used online, you can type your answers into the practice booklet.

As you work through the module, you'll be completing activities that will prepare you for an internal assessment of AS91264 Use statistical methods to make an inference | Te whai i ngā tikanga o te tūhuratanga tauanga hei whakaputa hīkaro (version 3).



Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
Use statistical methods to make an inference.	Use statistical methods to make an inference, with justification.	Use statistical methods to make an inference, with statistical insight.

Achieving AS91264 contributes four credits towards the 10 Numeracy credits at Level 1 or above that you need for University Entrance (UE). Other Sorted in Schools modules that can support you to gain Literacy and Numeracy credits are:

- **Money Matters** (AS91026, Level 1, 4 credits)
- **Statistical Reports** (AS91266, Level 2, 2 credits)
- **Questionnaire Design** (AS91263, Level 2, 3 credits)
- **Economic Data, Issues, and Analysis** (AS91226, Level 2, 4 credits).

About Sorted in Schools - Te whai hua - kia ora!

Sorted in Schools is a government-funded financial capability programme fully aligned to the New Zealand Curriculum. Free to use, Sorted in Schools helps young New Zealanders develop their money skills.

Why financial capability matters

Being good with money is an essential life skill. Financial capability means being equipped with the knowledge, skills and confidence to make good financial decisions at each life stage, and attain goals with choices. Research shows that 16–24 year olds are, however, vulnerable to falling into debt that can hold them back. In addition, over 80% of school leavers told us they wished they had learned more about money at school. We're changing that! Our learning materials equip you with know-how to start your financial journey on the right foot. The earlier you become good with money, the better you will fare throughout your life.

Build your financial capabilities while you learn about Statistical Inference

This module is designed to support you to both achieve success in selected NCEA assessments and build your financial capabilities.

Financial capability involves developing skills that will help you to feel confident about how to use and manage your money in order to achieve your goals, both now and in the future.

All of the Sorted in Schools learning materials include a combination of key financial capability concepts, or Sorted Themes, to help you develop your financial skills, knowledge, and behaviours. In this module, you will come across these Sorted Themes:



KiwiSaver



Retirement



Managing my Money

You can find resources linked to each of these themes on the [student activities page of the Sorted in Schools website](#). Click on Theme and select an option from the dropdown menu. The resources include booklets, powerpoints, infographics, videos, and interactive activities. You can search for different types of resources using the Media option.

Resources

Interested in learning more about your financial identity and how this might impact the ways you manage your money? You can find more resources on the [Student Activities page of the Sorted in Schools website](#).



Be sure to watch the [Sorted in Schools Inequality video](#) that accompanies this module.



The context explored in the Statistical Inference module

Throughout the module, you'll be learning about the gender pay gap, with a particular focus on how much money New Zealanders have invested in KiwiSaver.

You may already be aware that Aotearoa New Zealand, like almost all other countries in the world, has a gender pay gap. This means that, on average, males in Aotearoa New Zealand earn more than females. In 2020, the gender pay gap was 9.5 percent. That's less than 1998, when it was 16 percent, but there hasn't been much improvement since 2017.

The reasons for the gender pay gap are complex and interconnected. Here are some factors that contribute to the gender pay gap:

- **Pay inequalities** – jobs that are mainly done by females (for example, nursing, healthcare, and retail) tend to be paid less than jobs that are mainly done by males (for example, technology, construction, engineering).
- **Career breaks** – females often take time out from paid work to have children or care for elderly relatives. As well as the immediate effects of not earning money during this time, taking breaks from work can result in females having fewer opportunities for career progression and promotion, resulting in lower incomes. Females are also more likely to work part-time in order to be able to meet family needs. Part-time work tends to pay less per hour than full-time work does.
- **Family structures** – females are more likely than males to be solo parents and often experience worse financial outcomes when relationships end.

For more information on the gender pay gap, see the [Gender Pay Gap article by Manatū Wāhine Ministry for Women](#).

One consequence of the gender pay gap is that females have less money to save and invest and, as a result, less money when they reach retirement age. This difference is called the gender investment gap. The gender investment gap places an extra financial burden on females and is compounded by the fact that females tend to live longer than men.



Research conducted by the ANZ bank in 2017¹ showed that females' KiwiSaver balances are, on average, lower than males' in all age ranges. The biggest difference is between the ages of 45 to 54. In this age group, the average KiwiSaver investment for females is only about 75 percent of the average investment for males.

Supporting females to keep investing in KiwiSaver is one way to help reduce the gender investment gap.

KiwiSaver

KiwiSaver is a voluntary investment scheme set up by the government to help people get ready for retirement. Any New Zealand citizen can join KiwiSaver. When you invest in KiwiSaver, investment experts invest the money in your KiwiSaver account so that it grows over time.

KiwiSaver funds are mainly for retirement, so although it's your money, you can't use it until you turn 65. Two important exceptions are that you can use your funds to help buy your first home (after investing in KiwiSaver for at least three years) and, if you end up in a situation where you can't afford to pay for things such as food or shelter, you can apply to get access to the contributions you have made.

To encourage people to invest in KiwiSaver, the government contributes 50 cents for every dollar people aged 18 to 65 invest, up to a maximum of \$521 a year.

Level of investment

If you are an employee, you can choose how much of your pay goes into your KiwiSaver account. The options are 3%, 4%, 8%, and 10% of your pay. You can also make lump sum payments at any time. Your employer has to put in at least 3% of what you get paid as well – that's extra money that you don't get if you're not a KiwiSaver investor.

If you are a freelancer, gig worker, contractor, or work for yourself, you can choose how much money you want to invest and have the option of making regular payments and/or paying lump sums.

Level of risk

All investments involve an element of risk. When you join KiwiSaver, you can choose the level of risk you want to take. There are five different levels. For example, if you want a low level of risk, you might choose a “defensive” fund. If you want a higher level of risk, with potentially higher returns, you might prefer a “growth” or “aggressive” fund. If you’re somewhere in-between, you might choose a “balanced” fund.

Factors that contribute to the level of risk that people choose include how soon they will want to use the money and their personal feelings about taking financial risks.

Women are statistically more likely than men to invest in low-risk conservative funds. Conservative funds often have lower returns than growth or aggressive funds that come with more risk.

	Defensive	Conservative	Balanced	Growth	Aggressive
Your level of risk					
Likely ups and downs					
Potential results					
Invest for at least	1-3 years	2-6 years	5-12 years	10 years	13 years

You can read more about KiwiSaver using this Sorted.org guide: [KiwiSaver - How KiwiSaver works & why it’s worth joining.](#)

You can read more about KiwiSaver fund types and levels of risk on the Sorted website. This [fund finder tool](#) can help New Zealanders work out which type of fund is right for them.

 **Complete the Module Enquiry Context Activity**
in the Student Practice Booklet

Topic overview

Here is an overview of the topics you will explore in this module:

- **Topic One: Establishing a purpose and an investigative question**
Identifying a problem to investigate, defining the population, sub-groups, variables, and measure of interest, developing an investigative question.
- **Topic Two: Selecting a sample**
Representativeness and lack of bias, advantages and disadvantages of different types of samples (simple random, stratified, systematic)
- **Topic Three: Displaying data and calculating statistics**
How to interpret a box plot, how to use NZGrapher to create a box plot, how to select a sample using NZGrapher.
- **Topic Four: Comparing box plots and summary statistics**
Using PEEL to make mathematical statements, comparing box plots by referring to their central tendency, symmetry, spread, overlap, and unusual features, knowing how to remove outliers.
- **Topic Five: Confidence intervals**
Why samples vary, why confidence intervals are more useful than point estimates, how to construct a confidence interval, how to interpret a confidence interval, how to draw a conclusion.
- **Topic Six: Writing your report**
How to use the PPDAC statistical inquiry cycle to structure your report.

Understanding how you will be assessed

The assessment activity requires you to use statistical methods to make an inference.

The following table provides a summary of the evidence required for achievement at different levels:

Evidence/Judgements for Achievement	Evidence/Judgements for Achievement with Merit	Evidence/Judgements for Achievement with Excellence
<p>I can show evidence of using each component of the statistical inquiry cycle to make an inference.</p> <p>Problem:</p> <p>I can:</p> <ul style="list-style-type: none"> specify the purpose of my investigation <p><i>OR</i></p> <ul style="list-style-type: none"> write a clear investigative question. <p>Plan</p> <p>I can:</p> <ul style="list-style-type: none"> identify which variables I will use; these variables need to be relevant to my investigation identify which sampling method I will use. <p>Data</p> <p>I can:</p> <ul style="list-style-type: none"> select a random sample and provide evidence of how I selected it select a sufficient number of data values 	<p>I can link each component of the statistical inquiry cycle to the context and/or populations when making an inference.</p> <p>I can also support all of my statements with evidence.</p> <p>Problem:</p> <p>I can:</p> <ul style="list-style-type: none"> specify the purpose of my investigation <p><i>OR</i></p> <ul style="list-style-type: none"> write a clear investigative question that involves comparing two medians. <p>I can link the purpose of my investigation or my investigative question to the situation being investigated.</p> <p>Plan</p> <p>I can:</p> <ul style="list-style-type: none"> identify which variables I will use; these variables need to be relevant to my investigation 	<p>I can integrate my statistical and contextual knowledge throughout the statistical inquiry cycle to make an inference.</p> <p>Problem:</p> <p>I can:</p> <ul style="list-style-type: none"> specify the purpose of my investigation <p><i>AND</i></p> <ul style="list-style-type: none"> write a clear investigative question that involves comparing two medians. <p>I can link the purpose of my investigation or my investigative question to the situation being investigated.</p> <p>Plan</p> <p>I can:</p> <ul style="list-style-type: none"> identify which variables I will use; these variables need to be relevant to my investigation identify which sampling method I will use



that are relevant to my investigation.

Analysis

I can:

- display the data
- provide summary statistics
- discuss the distributions of the samples and identify at least two comparative features of the sample distributions (shape, overlap, shift, spread, middle 50%, unusual or interesting features)
- discuss sampling variability including the variability of estimates
- make a correct inference.

Conclusion

I can:

- answer my investigative problem/question referring to the populations I am investigating
- clearly communicate my findings.

- identify which sampling method I will use
- explain why I chose the sampling method OR the sample size.

Data

I can:

- select a random sample and provide evidence of how I selected it; I need at least 30 values for each variable.

Analysis

I can:

- display the data
- provide summary statistics
- discuss at least two comparative features of the sample distributions (shape, overlap, shift, spread, middle 50%, unusual or interesting features); support my discussion with evidence that is linked to the context of my investigation
- discuss sampling variability including the variability of estimates

- explain why I chose the sampling method AND the sample size.

Data

I can:

- select a random sample and provide evidence of how I selected it; I need at least 30 values for each variable.

Analysis

I can:

- display the data
- provide summary statistics
- discuss at least three comparative features of the sample distributions (shape, overlap, shift, spread, middle 50%, unusual or interesting features); include references to statistical processes and the context of my investigation.
- discuss sampling variability, including the variability of estimates
- make a correct supported inference.

	<ul style="list-style-type: none"> • make a correct supported inference. <p>Conclusion</p> <p>I can:</p> <ul style="list-style-type: none"> • answer my investigative problem/question • clearly communicate my findings • demonstrate my understanding of the difference between sample calculations and population estimates • link my findings to the contexts and the populations I have investigated. 	<p>Conclusion</p> <p>I can:</p> <ul style="list-style-type: none"> • answer my investigative problem/question • clearly communicate my findings • demonstrate my understanding of the difference between sample calculations and population estimates • link my findings to the contexts and the populations I have investigated. • I can also: • justify my inference, integrating my statistical and contextual knowledge <p><i>OR</i></p> <ul style="list-style-type: none"> • reflect on the process <p><i>OR</i></p> <ul style="list-style-type: none"> • consider other explanations.
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Assessment tips:



The student booklet provides assessment tips that will help you understand the requirements of achieving at Merit and Excellence level.