NZDep2023 Index of Socioeconomic Deprivation: User's Manual

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Contents

The authors 3

Acknowledgments 5

Ethics and confidentiality 5

Introduction 6

Uses for NZDep2023 8

File information 10

How to use the index 13

Frequently asked questions 15

Glossary 18

Reference 18

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Acknowledgments

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Ethics and confidentiality

Ethical approval for the original NZDep91 project was obtained in May 1995 from the Central Regional Health Authority Wellington Ethics Committee.

Access to the data used in this study was provided by Stats NZ under conditions designed to give effect to the security and confidentiality provisions of the Data and Statistics Act 2022. The results presented in this study are the work of the authors, not Stats NZ or individual data suppliers.

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Introduction

NZDep2023 is an updated version of the NZDep91, NZDep96, NZDep2001, NZDep2006, NZDep2013 and NZDep2018 indexes of socioeconomic deprivation. NZDep2023 combines nine variables from the 2023 census which reflect eight dimensions of socioeconomic deprivation. NZDep2023 provides a socioeconomic-deprivation score for each Statistical Area 1 and its constituent meshblocks, in New Zealand.

Meshblocks are the smallest geographical units defined by Stats NZ. They are the building blocks for their small geographical areas, SA1 [Statistical Area 1], which generally contain between 100 and 200 people. These areas, and sometimes combinations of them, were used as the basis from which NZDep2023 was calculated.

The NZDep2023 index of socioeconomic deprivation has two forms—an ordinal scale and a continuous score.

- The NZDep2023 index of socioeconomic deprivation ordinal scale ranges from 1 to 10, where 1 represents the areas with the least deprived scores and 10 the areas with the most deprived scores.

- The NZDep2023 index of socioeconomic deprivation interval variable is the first principal component score, which has been scaled to have mean 1000 index points and standard deviation 100 index points. The NZDep2023 10-point scale is derived from this interval variable.

The NZDep2023 scale of socioeconomic deprivation from 1 to 10 divides New Zealand into tenths of the distribution of the first principal component scores. For example, a value of 10 indicates that the SA1 (or meshblock) is in the most deprived 10 percent of our NZDep-small-areas in New Zealand, according the NZDep2023 scores.

Important points to note:

- NZDep2023 socioeconomic-deprivation scores apply to areas rather than individual people.
- The 1 to 10 scale is ordinal not interval.

- First principal component scores may be used, if desired, instead of the 1 to 10 scale.

NZDep2023 combines the following census data (calculated as proportions for each small area):

Dimension of socioeconomic deprivation	Description of variable
Communication	People with no access to the Internet at home
Income	People aged 18-64 receiving a main means tested benefit
Income	People living in equivalised* households with income below an income threshold
Employment	People aged 18-64 unemployed
Qualifications	People aged 18-64 without any qualifications
Owned home	People not living in own home
Support	People aged <75 living in a sole parent family
Living space	People living in equivalised* households below a bedroom occupancy threshold (i.e. overcrowding)
Living condition	People living in dwellings that are always damp and/or always have mould greater than A4 size

*Equivalisation: methods used to control for household composition.

Further information regarding NZDep may be found in the following reports, methodological articles, and atlases:

Atkinson J, Salmond C, Crampton P, Viggers H, and Lacey K (2024). *NZDep2023 Index of Socioeconomic Deprivation: Research Report*. Wellington, Department of Public Health, University of Otago, Wellington. www.otago.ac.nz

Atkinson J, Salmond C and Crampton P (2019). *NZDep2018 Index of Deprivation*. Wellington, Department of Public Health, University of Otago, Wellington. www.otago.ac.nz and www.moh.govt.nz.

Crampton P, Salmond C and Atkinson J (2019). A comparison of the NZDep and New Zealand IMD indexes of socioeconomic deprivation. *Kōtuitui: New Zealand Journal of Social Sciences Online*. https://www.tandfonline.com/doi/full/10.1080/1177083X.2019.1676798

Salmond C and Crampton P (2007). *NZDep2006 Index of Deprivation*. Wellington, Department of Public Health, University of Otago, Wellington, www.otago.ac.nz and www.moh.govt.nz.

Crampton P, Salmond C and Kirkpatrick R (2004). *Degrees of Deprivation in New Zealand: An atlas of socioeconomic difference. 2nd Edition*. Auckland, David Bateman Ltd.

Salmond C and Crampton P (2002). NZDep2001 Index of Deprivation. Wellington, Department of Public Health, Wellington School of Medicine and Health Sciences. http://www.moh.govt.nz/moh.nsf/pagesmh/3357?Open

Salmond C and Crampton P (2002). Heterogeneity of deprivation within very small areas. *Journal of Epidemiology and Community Health,* 56:669-670.

Salmond C and Crampton P (2001). NZDep96 – What does it measure? *Social Policy Journal of New Zealand*, 17:82-100.

Crampton P, Salmond C, Kirkpatrick R, Scarborough R and Skelly C (2000). *Degrees of Deprivation in New Zealand: An atlas of socioeconomic difference*. Auckland, David Bateman Ltd.

Salmond C, Crampton P and Sutton F (1998). *Research Report No 8, NZDep96 Index of Deprivation*. Wellington, Health Services Research Centre.

Crampton P, Salmond C and Sutton F (1997). *Research Report No 5: NZDep91 Index of Deprivation*. Wellington, Health Services Research Centre.

Uses for NZDep2023

NZDep91, NZDep96, NZDep2001, NZDep2006, NZDep2013, NZDep2018 and NZDep2023 have been developed with three principal purposes in mind: resource allocation, research, and advocacy.

1. Indexes of socioeconomic deprivation have application in funding formulas. For example, NZDep was used in the population-based funding formula for the former District Health Boards and in funding formulas for social services in other sectors.

2. Indexes of socioeconomic deprivation have application in research in a variety of settings such as health and other social services. For example, in the health sector,

many researchers use small area indexes to describe the relationship between socioeconomic deprivation and health outcomes; increasing levels of socioeconomic deprivation are associated with higher mortality rates, and higher rates of many diseases.

3. Indexes of socioeconomic deprivation are used by community groups and community-based service providers to describe the populations they serve, and to advocate for extra resources for community-based services.

File information

There are four files associated with NZDep2023, each one in both comma-delimited [csv] and EXCEL [xlsx] forms. The CSV files can be read easily by NOTEPAD, by spreadsheets (such as Microsoft EXCEL), and by statistical software (such as SAS or R).

1. The downloadable comma-delimited file (**NZDep2023_SA1.csv**) and the EXCEL file (**NZDep2023_SA1.xlsx**) each have 32,523 SA1s (one per Statistical Area 1 (SA1) for which we had information) with the following six fields (in order) named in the first row:

    - 2023 Statistical Area 1 code (**SA12023_code**) [7 numeric characters]
    - NZDep2023 socioeconomic-deprivation scale, where 1 is least deprived and 10 is most deprived (**NZDep2023)** [the field is blank for the 74 SA1s omitted from the index]
    - NZDep2023 first principal component score standardised to mean 1000 index points and standard deviation 100 index points (**NZDep2023_Score**) [up to 4 numeric characters, and the field is blank for the 74 SA1s omitted from the index]
    - Usually Resident Population in the Statistical Area (**URPopnSA1_2023**) fixed randomly rounded to base 3 by Stats NZ.
    - 2023 Statistical Area 2 code (**SA22023_code**) [6 numeric characters]
    - 2023 Statistical Area 2 name (**SA22023_name**) [44 alphanumeric characters]

2. For assistance for those people using meshblocks we have produced a downloadable comma-delimited file (**NZDep2023_MB2023.csv**), or EXCEL file (**NZDep2023_MB2023.xlsx**), with the SA1 NZDep deciles and score values given to all the meshblocks (2023 version) within each SA1. There are 56,382 records, with 311 records having no NZDep2023 value (corresponding to the 74 SA1s with no values). The four fields on the file are:

    - 2023 Meshblock code (**MB2023_code**) [7 numeric characters, with leading zeros]

- NZDep2023 socioeconomic-deprivation scale for the SA1, where 1 is least deprived and 10 is most deprived (**NZDep2023**) [the field is blank for the 74 SA1s omitted from the index which equates to 311 meshblocks]
- NZDep2023 first principal component score for the SA1, standardised to mean 1000 index points and standard deviation 100 index points (**NZDep2023_Score**) [up to 4 numeric characters, and the field is blank for the 74 SA1s omitted from the index which equates to 311 meshblocks]
- 2023 Statistical Area 1 code (**SA12023_code**) [7 numeric characters]

3. A further downloadable comma-delimited file (**NZDep2023_WgtAvSA2.csv**), or EXCEL file (**NZDep2023_WgtAvSA2.xlsx**), gives Statistical Area 2 numbers and names, a population weighted average NZDep2023 score for SA2s (**SA2_average_NZDep2023_score**), and a 1 to 10 socioeconomic-deprivation scale for SA2 averages (derived from the distribution of the weighted average scores), where 1 is least deprived and 10 is most deprived (**SA2_average_NZDep2023**). There are 2,321 records, one for each of the SA2s for which we had information. Fifty-one of these have no NZDep2023 value. The six fields, named in the first row, are:

   - 2023 SA2 code (**SA22023_code**) [6 numeric characters]
   - 2023 SA2 name (**SA22023_name**) [44 alphanumeric characters]
   - 2023 SA2 population weighted average NZDep2023 scale (**SA2_average_NZDep2023**) [the field is blank for the 51 SA2s omitted from the index which were comprised mainly of small off-shore islands, inlets, etc.]
   - 2023 SA2 population weighted average NZDep2023 score (**SA2_average_NZDep2023_score**) [the field is blank for the 51 SA2s omitted from the index, which were comprised mainly of small off-shore islands, inlets, etc.]
   - 2023 SA3 code (**SA32023_code**) [5 numeric characters]
   - 2023 SA3 name (**SA32023_name**) [38 alphanumeric characters]

4. A further downloadable comma-delimited file (**NZDep2023_WgtAvDom.csv**), or EXCEL file (**NZDep2023_WgtAvDom.xlsx**), gives Domicile-code numbers, a population-weighted average NZDep2023 score for each Domicile-code **Dom_average_NZDep2023_score**), and a 1 to 10 socioeconomic-deprivation scale for Domicile-code averages (derived from the distribution of the weighted-average scores), where 1 is least socioeconomically deprived and 10 is most socioeconomically deprived (**Dom_average_NZDep2023**). There are 1,885 records, one for each of the Domicile-codes obtained via the MB2023-to-Domicile-code concordance in the 2023 geography file. The five fields, named in the first row, are:

   - Domicile code (**Domicile_code**) [4 numeric characters, with leading zeros]
   - Area Unit 2017 code (**AU2017_code**) [6 numeric characters]
   - Area Unit 2017 name (**AU2017_nam**e) [32 alphanumeric characters]
   - Domicile-area population-weighted average NZDep2023 scale (**Dom_average_NZDep2023**)
   - 2023 Domicile-area population-weighted average NZDep2023 score (**Dom_average_NZDep2023_score**)

How to use the index

Using the index as a socioeconomic-deprivation variable in analysis

1. Clean addresses, i.e. make sure components of addresses are in the right fields. Note that rural delivery (RD) addresses cannot be geocoded. Address cleaning is often done commercially by various organisations, along with geocoding.

2. Geocode each observation in your outcome dataset (e.g. mortality, crime events, immunisation status) to SA1 or meshblock. Automatic geocoding services are provided by various organisations or various websites.

3. Merge your dataset with the NZDep2023 file (**NZDep2023_SA1.csv** using SA1 number, or **NZDep2023_MB2023.csv** using meshblock number), thus linking each geocoded address with its area socioeconomic-deprivation score.

4. Examples of possible analyses include:

    - If you are comparing two (or more) groups (e.g. fully immunised versus not fully immunised; or cot death cases versus control babies) compare the distributions of 10 scale values (or principal component scores) using a non-parametric test (since the scale values are ordinal, and the principal component scores are skewed, and may be more skewed in your dataset).

    - If you are comparing rates of events with socioeconomic deprivation (e.g. mortality rates in a region compared across the ten socioeconomic-deprivation scale values) you could calculate a rank correlation coefficient, or simply plot your results. Note that the denominators for your rates can be added up from the usually resident SA1 populations.

Calculating an average **NZDep_score_2023** *value for SA2 areas*

Population weighted average scores and their decile scale values for Stats NZ's 'Statistical Area 2' geographies (SA2) should be avoided where possible as they disguise heterogeneity within those areas.

However, in circumstances where geocoding can only be carried out at the level of SA2s then population-weighted average scores and their decile scale values have to be used. For convenience these have already been calculated according to the scheme described in the next section. They are provided in a downloadable file (**NZDep2023_WgtAvSA2.csv** or **NZDep2023_WgtAvSA2.xlsx**) described in the previous *File Information* section (page 10).

Calculating an average NZDep_score_2023 value for 2017 'domicile' areas

Some health survey data may still use 2017-based 'domicile' as the area on their primary records. There is no direct concordance between the 2017 domiciles and *any* 2023 geography, but we have been able to use unit-record data to calculate a weighted average NZDep2023 score for each 2017-defined domicile area. These are provided in a downloadable file (**NZDep2023_WgtAvDom.csv** or **NZDep2023_WgtAvDom.xlsx**) described in the previous *File Information* section (page 10).

Calculating an average **NZDep_score_2023** *value for a user defined region*

1. Define the regions in terms of the component SA1s (**SA12023_code**).

2. To calculate a score for a region we suggest you take the weighted average of **NZDep2023_score** values, using population counts obtainable from the Stats NZ website or the usually resident population **URPopnSA1_2023** on **NZDep2023_SA1.csv**, across all the SA1s in the region.

3. A weighted average is obtained by multiplying each SA1 **NZDep2023_score** value by the SA1 population, adding these over all the SA1s in the region, and dividing this total by the total regional population count (the sum of the populations for all SA1s in the region).

Please note:

Average socioeconomic-deprivation values for user defined regions calculated using the **NZDep2023** scale from 1 to 10 are less accurate than average socioeconomic-deprivation values calculated using **NZDep2023_score** values.

Frequently asked questions

A particular SA1 or meshblock does not have a value for NZDep2023. Why?

SA1s were the building blocks for creating NZDep2023. NZDep values have not been released for 74 SA1s. Some (23) of the SA1s had no or extremely minimal information and were not included in the development of NZDep2023. The values for the other 51 of these SA1s have been withheld as unreliable (see next FAQ).

How are very small SA1s handled in NZDep2023?

SA1s with populations of less than 100 people have been joined with neighbouring SA1s within an SA2 to make NZDep-small-areas with at least 100 people before creating the index. In the file *NZDep2023_SA1.csv* (or *NZDep2023_SA1.xlsx)* the small-area scale value has been assigned to each component SA1. Note that if any SA1, or joined SA1s, forming an NZDep-small-area have more than one proportion (out of nine) based on fewer than 20 people the NZDep2023 value is considered unreliable and has been withheld.

The distribution of NZDep2023_score does not have mean = 1000 and standard deviation = 100. Why?

The first principal component was created from a file of 30,629 NZDep-small-areas with populations (as far as possible) of 100 persons or more. Most (94.5 percent) of our NZDep-small-areas are single SA1s, the remainder being a combination of two or more neighbouring SA1s. In the file of 30,629 NZDep-small-areas the mean is 1000 and the standard deviation is 100. For usage we have provided the file of all SA1s giving each component SA1 of any agglomerated NZDep-small-area the NZDep2023_score value of the NZDep-small-area of which it is a component.

How are empty SA1s handled in NZDep2023?

SA1s are areas where people live, but not necessarily all the time (such as holiday homes). SA1s may also have unoccupied houses which would have been occupied in the past, and may be occupied in the future. Empty SA1s were agglomerated with connected non-empty SA1s for the purposes of creating our NZDep-small-areas—for which the index is calculated—on the assumption that future occupation will, to some extent, mirror the localised small neighbourhoods. The alternative was to remove such SA1s from the index. This could give rise to a geo-coded address in the future for which no NZDep value at all was available. In this situation the observation would be 'missing' in any analysis, whereas, in the procedure adopted, the observation would be available with the best estimate of a socioeconomic-deprivation score. When mapping NZDep in colour by SA1s, therefore, it may be advisable to leave any empty SA1s uncoloured.

The distribution of NZDep2023 does not have exactly 10 percent in each of its 10 categories. Why?

The NZDep2023 deciles (divisions into tenths) were created based on the 30,629 NZDep-small-area scores, not from SA1s, meshblocks, households, families or individuals. Each NZDep-small-area is unique in its own way, with its own combination of these. Therefore, a slight variation in the number of SA1s, meshblocks, households, families, and individuals in each NZDep2023 decile is to be expected. See comments about NZDep2023_score in the FAQ above.

Can I compare NZDep scores between different censuses?

Comparisons of areas as small as a single meshblock or a single SA1, across time, may not be meaningful. Comparisons of areas at a higher aggregation, such as Territorial Authorities, or SA2s, should be reasonable, although we advise caution in interpreting small changes over time as being practically meaningful.

Comparing relationships between socioeconomic deprivation and another variable, over time, is reasonable.

See the discussion in Appendix 5 of the report *NZDep2023 Index of* Socioeconomic *Deprivation: Research Report* (2024).

How should I report NZDep2023?

This depends on your audience and subject matter. For graphs we recommend deciles or quintiles. For summary reports we suggest: deciles, quintiles, grouping (1-6, 7-8, 9-10), or percentage in (9-10). We do not recommend grouping (1-5, 6-10) as this is likely to mask the experience of the most socioeconomically deprived portion of the population.

How should I report NZDep2023 for a large area?

The procedure outlined in "Calculating an average NZDep_score_2023 value for a user defined region" is appropriate when combining only a few SA1s. Large areas (for instance TAs) will usually contain people with a great diversity of socioeconomic circumstances and the weighted average method does not adequately convey the variety of different experiences. Best practice for reporting NZDep2023 for larger areas is either (i) sum the number of people in each decile across all the SA1s of the larger area, and report the distribution of people across the deciles of the larger area, or (ii) report the percentage of people in deciles 9 and 10 of the larger area (quintile).

Is the difference in between NZDep2023 deciles 3 and 6 the same as the difference between NZDep2023 deciles 7 and 10?

No. The scores in NZDep2023 form a skewed distribution with a long tail. The average socioeconomic-deprivation characteristics of people and households living in the decile 3 and 6 areas are much more similar than the characteristics of people and households living in the decile 7 and 10 areas.

Why are about 10 percent of people still living in the most socioeconomically deprived areas (despite all the hard work at implementing policies to improve people's lives)?

NZDep2023 is defined as an index of relative, not absolute, socioeconomic deprivation. The way the index is created means that about 10 percent of people are living in each socioeconomic-deprivation decile; this would be true even if the entire population of Aotearoa New Zealand had experienced a great increase in living standards. The primary use of NZDep2023 is to show which areas are more socioeconomically deprived than others, not how socioeconomically deprived each area, or the country as a whole, is in absolute terms.

Glossary

Decile	Division into tenths.
Meshblock	The smallest geographical area that StatsNZ reports data on, typically containing 30-60 dwellings and 60-120 residents.
NZDep-small-area	The individual SA1s, or a combination of neighbouring SA1s inside an SA2, that the NZDep team used to create the NZDep index. SA1s were combined to create a large enough population in an area to ensure that the statistical processes could be expected to be robust.
Quintile	Division into fifths.
SA1: Statistical Area 1	The smallest geographical area that StatsNZ routinely reports on; typically containing 100-200 residents.
SA2: Statistical Area 2	An output geography for a community that interacts socially and economically; typically containing 1000-4000 residents.
SA3: Statistical Area 3	An output geography that is intermediate between SA2 and TA, ideally representing a 'community of place'.
TA: Territorial Authority	In this context, the area under the jurisdiction of a city or district council.

Reference

Atkinson J, Salmond C, Crampton P, Viggers H and Lacey K (2024). *NZDep2023 Index of Socioeconomic Deprivation: User's Manual*.

This report is available on the University of Otago website.