The wheels on the bus: Where do we go to school and why?

Part B: Visualisation

Introduction:

School is a formative experience, where skills are gained and friendships are made. This is true regardless of where one goes to school; however, as I found in Part A of this project, there are characteristics which appear to make certain schools more appealing to certain demographics. Is this for good reason, or is there some bias at play?

In my previous report I mentioned the role deciles can have in swaying parents, and the phenomenon of "white flight" (Boyack, 2019). The New Zealand school system is clearly plagued by the "stigmatising of lower-decile schools" and "unequal access to educational opportunities", and I hope the visualisations presented in this report bring attention to these issues (Carpenter & Thrupp, 2011; Gordon, 1994, p. 124; as cited in Gordon, 2015, pp. 8-9). Being able to visualise exactly where these issues are occurring and to what degree may help schools and policy-makers to develop equitable solutions.

Data and methods:

After processing and analysing data related to North Island secondary schools and their neighbourhoods in Part A, I selected variables whose relationships I believed would be interesting to visualise for Part B. These variables are European/Māori student percentage of schools, median deprivation score of Statistical Area (SA)2s, decile, authority and co-educational status. These variables are sourced from the 2018 Deprivation Index (University of Otago, n.d.), SA2 2018 boundaries (Stats NZ, 2018), and Ministry of Education (MoE) School Directory (MoE, 2021).

Once again, I used the R programming language through the integrated development environment RStudio to manipulate and display my data. For Part B of the project, I used the tidyverse, sf and tmap packages.

As I simply imported my workspace from Part A into the code for Part B, there is barely any processing to go through as the data remains the same. The only change is that I removed two schools from schools_data – OneSchool Global and Te Aho o te Kura Pounamu – as these schools have multiple campuses across the country or are for distance students respectively, therefore the coordinates assigned to them are not representative of where their students are, and displaying them may make the visualisations misleading.

The only other addition is that of two objects used to define breaks – dbreaks, for deprivation and decile, and ebreaks, for European student percentage.

Results:
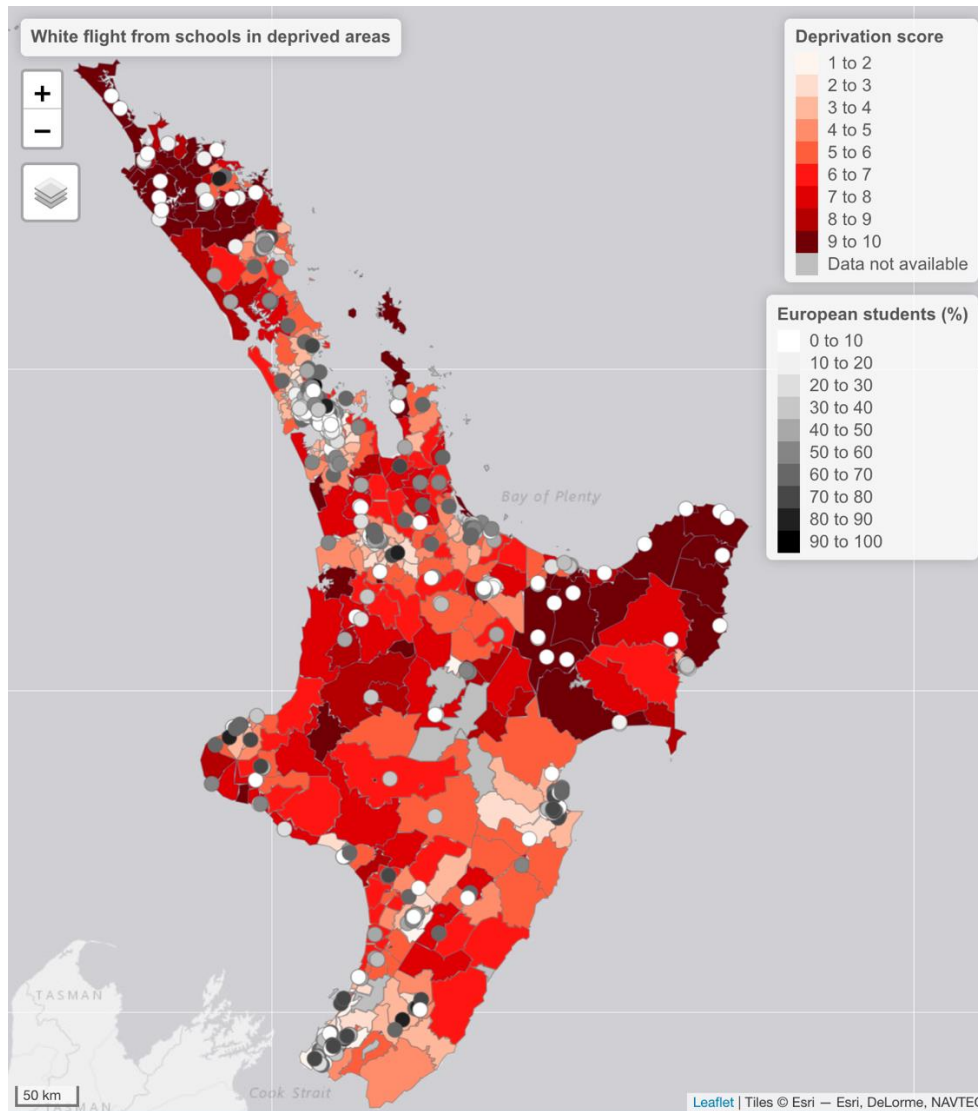
Map 1: White flight from schools in deprived areas

Map 1 visualises the relationship between deprivation and European student percentage. The SA2 polygons are coloured by their median deprivation score, while the school locations are dots coloured by their European student percentage. While the remaining three maps use bubbles for the school locations, dots were used in this case so that the smaller SA2 polygons were not obscured, with the European student percentage represented by colour instead of size. This creates a clear contrast between the polygons and dots, with pale dots generally on dark polygons and vice versa. This contrast is particularly resonant in the East Cape and Northland, where the most common deprivation score is 9 to 10 and the most common European students percentage is 0 to 10. This conveys that schools in more deprived areas tend to have a lower proportion of European students.

These findings relate to Waldo Tobler's first law of geography: "Everything is related to everything else, but near things are more related than distant things" (1970). The clusters of high or low values such as in the East Cape and Northland show that deprivation spreads across SA2 boundaries; in fact, the imposition of these boundaries brings into question the modifiable areal unit problem, as they disguise any variation that occurs at a lower level and assume all places within each SA2 are the same.
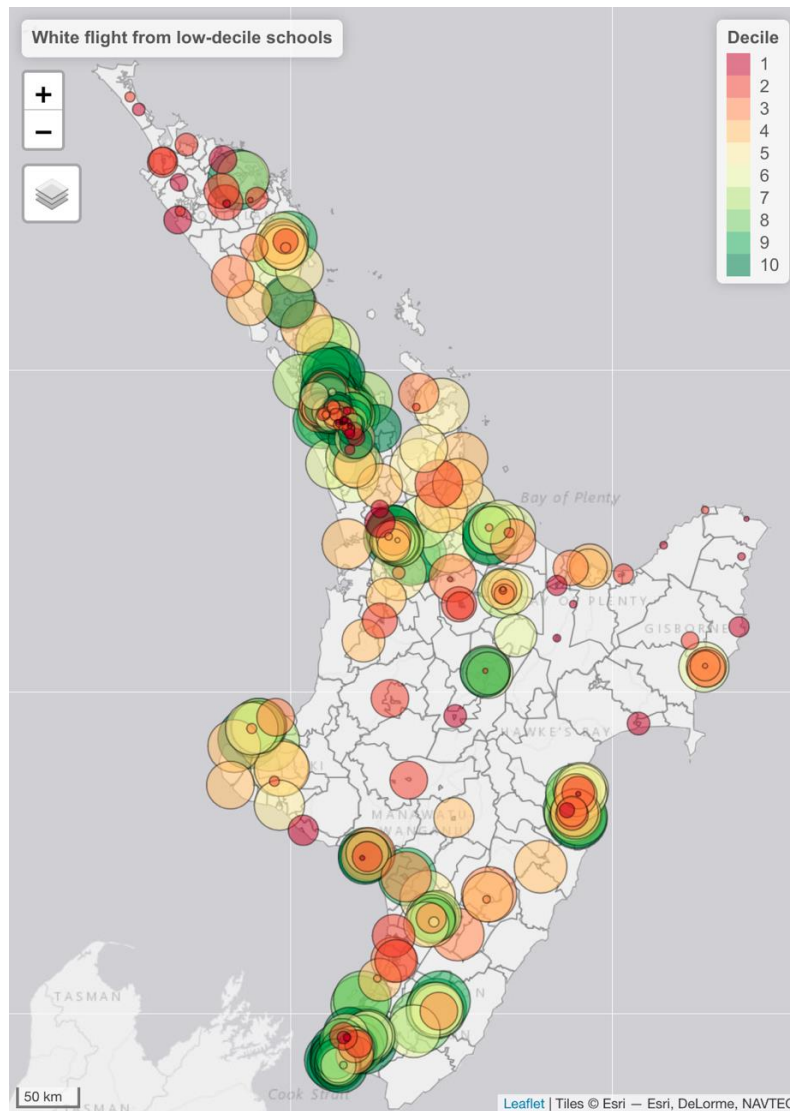
Map 2: White flight from low-decile schools

Map 2 visualises the relationship between decile and European student percentage. The school locations are bubbles coloured by their decile and sized by their European student percentage. A diverging red-yellow-green colour palette is used to highlight the disparity, with the colours matching stereotypes of good and bad and thus making the map more intuitive. The larger bubbles tend to be greener and the smaller ones redder, showing that low-decile schools tend to have a lower proportion of European students.

This map displays examples of both positive and negative spatial autocorrelation at the local scale, with rural areas such as the central North Island and East Cape showing positive autocorrelation of low-decile schools, while the more populated urban areas have negative autocorrelation with a more even mix of high- and low-decile schools.
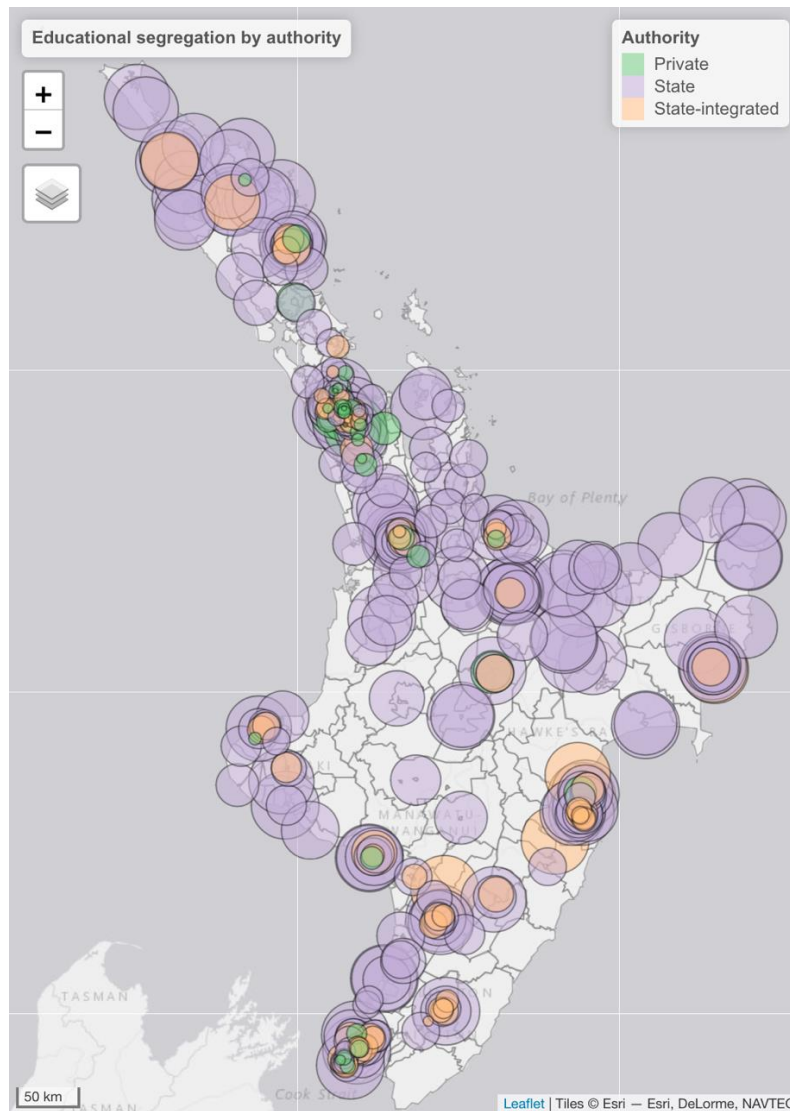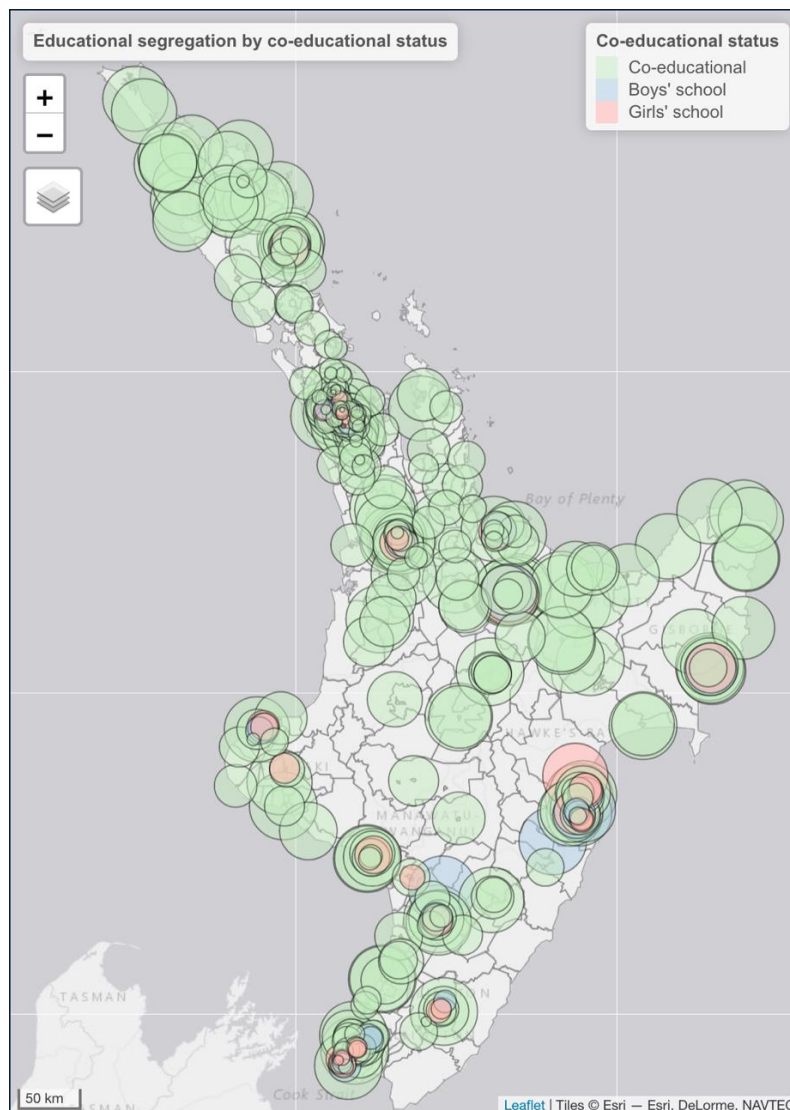
Map 3: Educational segregation by authority

Map 3 visualises the relationship between authority and Māori student percentage. The school locations are bubbles coloured by their authority and sized by their Māori student percentage. A categorical colour palette is used to distinguish the three authorities.

This map shows signs of positive autocorrelation and adheres to Tobler's (1970) first law of geography, as private and state-integrated schools appear in clusters in the main urban areas; perhaps because these places are where people are most likely to have the money and desire to attend such prestigious schools.

A potential issue with this map is the visual weight assigned to the state category by nature of how many state schools there are. This crowds the map and may make the viewer overestimate the values assigned to this category.

Map 4: Educational segregation by co-educational status

Map 4 visualises the relationship between co-educational status and Māori student percentage. The school locations are bubbles coloured by their co-educational status and sized by their Māori student percentage. A categorical colour palette is used to distinguish the three authorities, with the colours matching gender norms to make the map more intuitive.

If you consider boys' and girls' schools under the same category, this map displays signs of positive autocorrelation and adheres to Tobler's (1970) first law of geography, as there tends to be one not far from the other in order to cater for both boys and girls in that area.

As with the previous map, a potential issue with this map is the visual weight assigned to the co-educational category by nature of how many co-educational schools there are. This crowds the map and may make the viewer overestimate the values assigned to this category.

Discussion:

These four maps show that, for those families with the resources to choose, there can be a range of educational opportunities to choose from. Parents could rent or buy an expensive in-zone house to access private schools, they could buy their child a car so they can commute themselves across town to a higher-decile school, or they could just send them off to a reputable boarding school – that is, if they are wealthy enough. For those who are not, the only option tends to be their local school. While there is absolutely nothing wrong with that, it means lower-class families have been stripped of the right to educational choice. Unfortunately, this class division is also an ethnic division, with Pākehā benefitting the most.

Liz Gordon (2015, p. 10) makes the point that this choice is all too often influenced by "social rather than educational" factors of the schools. In other words, those with the ability to choose – Pākehā – are likely to choose a school where they would be happy for their child to "mix", one that mirrors their home environment; and that is the driver of white flight.

But what about those educational factors? After all, the whole point of a school is to educate, right? I would have loved to find out the correlations between educational success and my other variables, but unfortunately the New Zealand Qualifications Authority does not publicise each school's pass rates. As for what others have concluded, Gordon found "no evidence that choice and competition improve performance within schooling systems" (OECD, 2009; as cited in Gordon, 2015, p. 19); and Andrew Devonport found "no link between a school's NCEA [National Certificate of Achievement] achievement rates and how many of its students came from outside the school's zone" (Gates, 2017).

So what does the future hold? If nothing is done in an attempt to bridge the educational choice gap, let alone improve equity in a broader sense, then the gap will only widen (Gordon, 2015). It is not just the students who will suffer from this but the schools themselves, as reduced roll sizes limit the amount and variety of resources they can provide (Gordon, 2015).

Conclusion:

Though my data analysis in Part A and the maps provided in this report, I have highlighted the issue of unequal educational choice in the North Island. The next steps for research in this area could include analysis of travel data and performance data, as Davenport did, but presented spatially (Gates, 2017), and interviews could be conducted with parents and students to learn more about the rationale behind their choice. If we want to address this issue, perhaps schools that are higher-decile, private and so on could be mandated to provide more scholarships for Māori students, and to have a quota of Māori students who can enrol from outside the enrolment zone.

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