Stats NZ
Tatauranga Aotearoa

# Outcomes versus intentions

## Measuring migration based on travel histories

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In May 2017 Stats NZ introduced a new measure of migration based on the travel histories of people crossing the border into and out of New Zealand. This series will become a key part of the measure of international migration in New Zealand. It will also be a key part in decreasing the dependence on the traveller cards for migration estimates, beginning with work to remove the departure cards. Stats NZ will regularly update the migration series based on the new measure.

This paper provides a brief introduction to measuring migration, extends the time series that use the new measure, and adds insight into how migration outcomes compare with people's intentions as they cross the border.

Defining migrants using travel histories and the '12/16-month rule' introduces the new measure.

# Why do we measure migration?

Migration is a key part of population change in New Zealand. It is currently the primary driver of population increase, and it also influences cultural changes in society. To understand how these changes are occurring we must measure migration, and the characteristics of migrants, into and out of New Zealand.

Reasons for measuring migration include:

- it's a key input into population estimates (and projections), which are vital for policy planning, settings, infrastructure planning, spending, and allocating services
- to understand the changing nature of New Zealand's societal structure and demographics, and the sociological implications of these changes
- to understand the requirements of public service entities and how they change (eg district health boards, councils, education providers)
- to understand more about people and their motivations for making life-altering movements.

It is important to note that this not a measure of the legal status of travellers, but a definition based purely on the length of time a traveller spends in, or out of New Zealand.

# How do we currently measure migration?

The permanent and long term (PLT) migrant series – DataInfo+ is currently the primary measure of international migration into and out of New Zealand. Figures are estimated from what travellers crossing the border state on either the arrival or departure cards. Therefore it is based on how long the traveller intends to stay in New Zealand (or be away). This method allows a very timely estimate of migration as we can figure out a traveller's migrant status as soon as the card is filed. The resulting statistics are published around 21 days after the reference month.

However, traveller behaviour is not always consistent with the intentions they state at their border crossing. This may be due to:

- changes in circumstances
- inability to realise their goals in settling in
- misunderstanding the questions on the cards, and incorrectly reporting their intentions
- deciding to extend their visa, or stay/absence.

However, if we examine the movement history for a particular traveller, we can estimate how long they have actually spent in (or been away from) New Zealand. In other words, we can ascertain whether they were a migrant based on the outcome of their behaviour.

# What is the outcomes-based migration measure – the 12/16-month rule?

Defining migrant status by the 12/16-month rule uses travellers' observed travel sequences, and measures changes in their resident status based on their actual length of stay in New Zealand over a 16-month period following their travel. This rule is independent of the individual's legal residence status and is also independent of the information they state on arrival and departure (traveller) cards.

Differences between actual length of stay derived from travel histories, and reported intention of stay or time away from New Zealand on the traveller cards, may affect the relevance or accuracy of the initial classification of migrant (using the card information). This can result in estimates of migrant arrivals and departures being over- or under-reported when the traveller card is the primary information source used to determine migrant status.

Classification of migrant status by the 12/16-month rule observes travellers' past classification history by this rule, as well as their travel sequences over a 16-month follow-up period.

Subsequently, after we establish travellers' 16-month travel history (following the reference month), the rule assigns a final migrant status for those travellers who have had a change in resident status.

Note: A traveller is considered a resident if they have spent 12 out of the following 16 months in New Zealand (hence the name '12/16-month rule').

Defining migrants using travel histories and the '12/16-month rule' has technical information about this definition.

# Why introduce another measure of migration?

The PLT migration measure is generally a good indication of the contribution of migration to changes in New Zealand's resident population. The outcomes-based measure, or '12/16-month rule', is a more accurate representation of the number of migrants arriving and departing New Zealand. This makes it a more suitable input into figuring out how many people are resident in New Zealand. This is the estimated resident population (ERP).

Note: Resident simply means that New Zealand is the usual country of residence of a particular person. Their legal resident status may differ from this.

The numeric accuracy of migration is important, as it influences public policy, infrastructure planning, spending allocations, and the like, both directly, and through the ERP. It is also an important input into population projections, which are used for future planning by central government agencies, local and regional councils, and industry.

The disadvantage of the 12/16-month measure is the lack of timeliness. Because of the need for a follow-up period, it takes a minimum of 17 months after the travel has occurred for travellers'

migrant status to be available. While this is acceptable for some aspects of the ERP, for constructing a historic time series, and for migration assumptions that feed in to population projections, it is inappropriate for directly reporting migration levels.

To address the timeliness problem, we are also developing an approach to predict the traveller type (ie short-term traveller, or long-term migrant). This will provide an initial estimate of migration, which can be revised after the 16 months following the reference period – as more data about the travellers' movement patterns become available.

# How do the two measures differ? Some basic results

A new migration measure, which combines the outcomes-based measure (12/16-month rule) and a predictive model giving the final and provisional estimates, respectively, is likely to form the primary measure of migration in the near future. Here we briefly discuss the differences in the two measures, 12/16-month rule and PLT, by providing overall differences, and some specific examples.

Overall, the 12/16-month rule shows a greater flow of both migrant arrivals and departures, compared with the PLT measure. Figure 1 illustrates the differences in flows. The net migration tracks similar for both measures, especially since 2009.

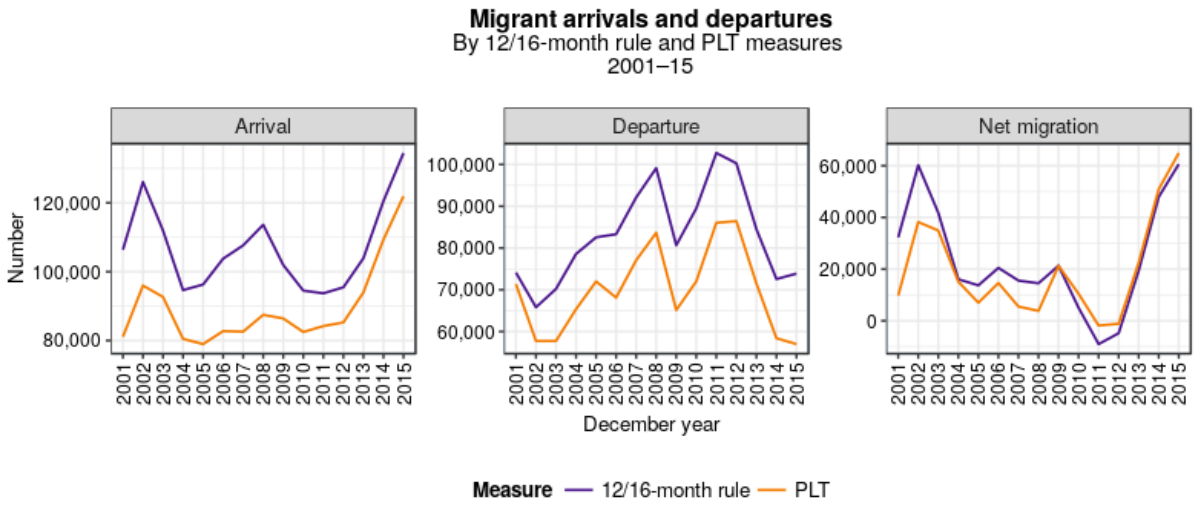
## Differences in the aggregate level flows of migrants

When travellers are classified by their intentions (PLT) rather than their actual travel histories (12/16-month rule), both migrant arrivals and departures are understated. In the December 2015 year:

- migrant arrivals were lower by around 12,500 (9 percent of total arrivals by the outcomes-based measure)
- migrant departures were lower by around 16,900 (23 percent of total departures by the outcomes-based measure)
- net migration gains were higher by 4,300 (7 percent of total net gain by the PLT measure).

Despite the differences between migrant numbers when comparing outcomes with intentions, the overall trend of migrant arrivals and departures is similar for both measures – both show significant rises and falls in the number of migrants for the same periods (figure 1).

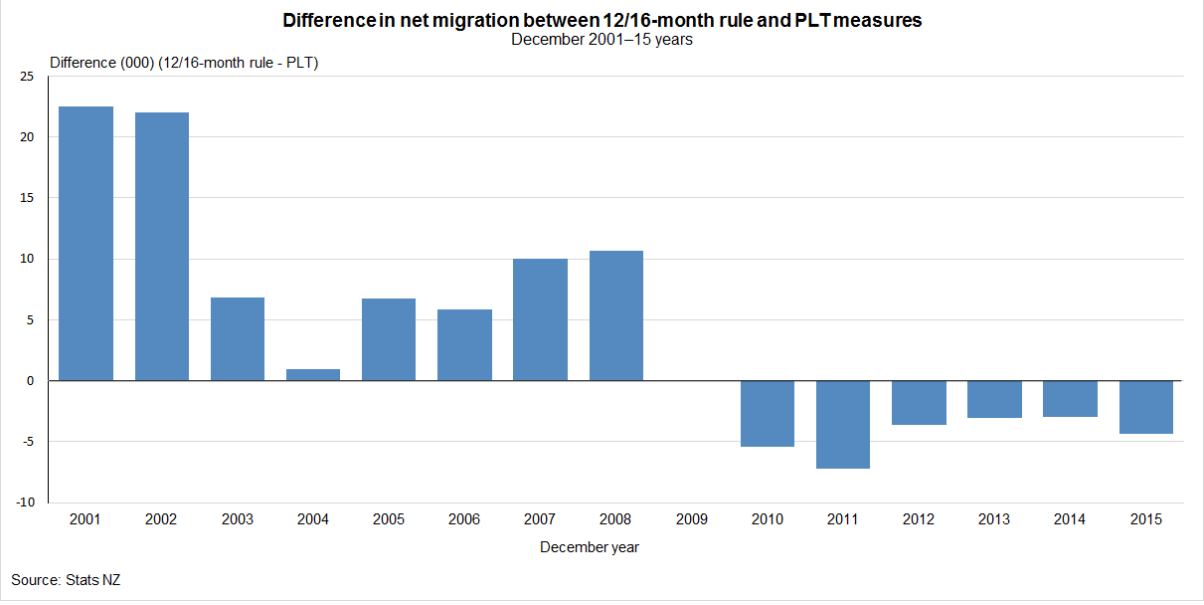
Figure 1




Source: Stats NZ

For net migration, the largest differences between the two measures was for the December 2001 and 2002 years – net migration by the PLT measure was understated by more than 20,000, which aligns with other statistical evidence (see figure 5 in Defining migrants using travel histories and the '12/16-month rule'). When outcomes are considered, the net gain in migration was about 60,000 in both 2002 and 2015 (see figure 1). In 2009, the difference between the measures was negligible. Between 2012 and 2015, net migration tracked closely for the two measures and differences in net migration were less than 5,000. Figure 2 provides a visual summary of the differences between the measures of net migration from 2001 to 2015.

Figure 2




Source: Stats NZ

## Looking deeper – differences in disaggregated results from the two measures

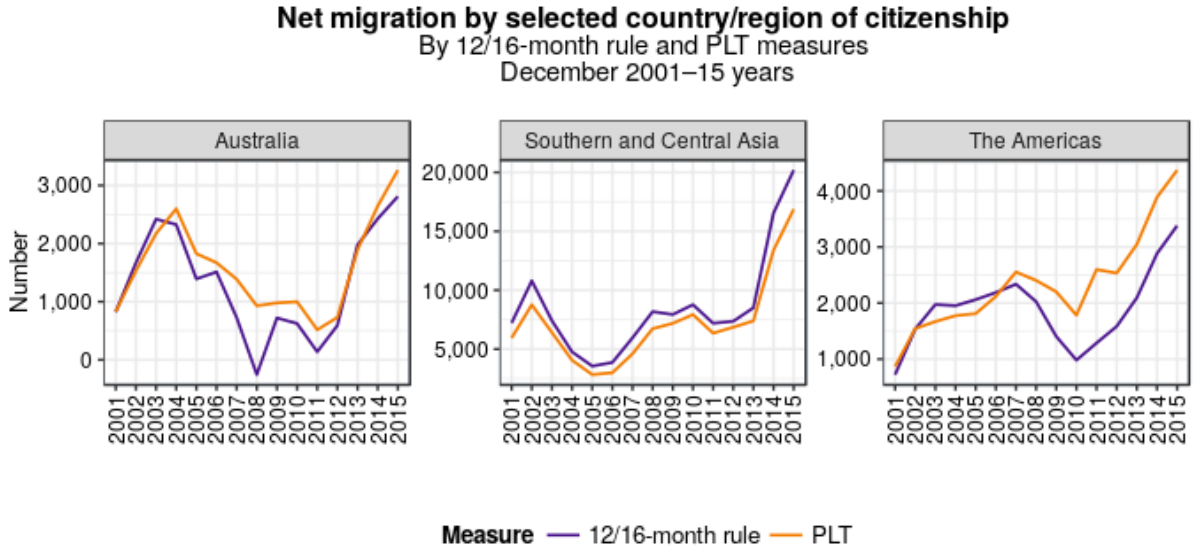
Differences between the two migration measures also appear at a disaggregated level. By country/region of citizenship, migration by the PLT measure consistently understated the flows of

migrant arrivals and departures. As with the aggregated level, the overall migration trend was similar for the two measures.

However, looking at figure 3 it is clear that all global regions are do not share a similar pattern of difference between the two measures. The PLT measure has underestimated net migration from Southern and Central Asian citizens since 2001, with the discrepancy growing larger in recent times.

Conversely the net migration gains from citizens of the Americas have been overstated by the PLT measure, compared to the outcomes of migrants who are citizens of that region.

Figure 3




Source: Stats NZ

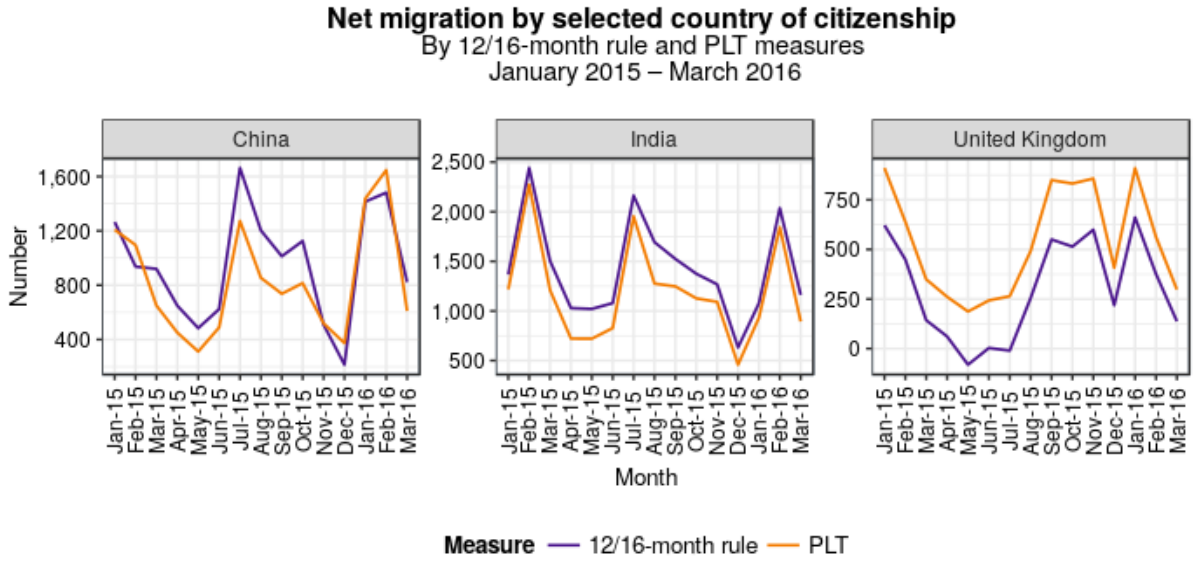
Figure 4 shows the differences in net migration for citizens of China, India, and the United Kingdom (UK). Net migration of Chinese citizens is neither consistently overstated, nor understated by the PLT measure, but Indian citizens, are consistently understated. This may indicate that Indian citizens understate their intended length of stay in New Zealand when they arrive.

For UK citizens, the PLT measure tends to overstate net migration.

UK citizens may be indicating the length of stay their visa allows, rather than the time they intend to stay in New Zealand (eg some arriving on a working holiday visa may state they are here for one year, although they intend to leave after nine months). This may be due to uncertainty in their plans on arrival.

The differences likely reflect the different types of migrants who are citizens of these nations. Chinese and Indian citizens are more likely to be student or resident arrivals, whereas UK citizens are more likely to be coming to New Zealand for work (which includes working holidaymakers).

Figure 4




Source: Stats NZ

# Changing intentions – people do change their minds

An advantage of using the 12/16-month rule to classify migrants rather than the PLT measure is that we can update a traveller's migrant status as time goes on. Consider the following example:

A traveller arrives in New Zealand on a student visa, and states they intend to stay for nine months on their arrival card. The intentions-based measure classes them as a visitor (irrespective of their visa type). However, when observing their travel history, we find they were in New Zealand for 12 of the following 16 months, after their initial arrival. In such a case, the 12/16-month rule would accurately classify their initial arrival movement as a 'migrant arrival movement'.

We can now account for travellers who state they intend to stay in New Zealand for less than a year but end up staying for longer. This gives us a much more accurate measure of actual migration.

Our analysis shows that in the December 2015 year almost a quarter (6,600) of the 27,400 travellers on student visas classified as visitor arrivals by the intentions-based measure were classified as migrant arrivals by the 12/16-month rule. Conversely almost a fifth (4,900) of the 27,900 travellers on student visas classified as migrant arrivals by the intentions-based measure were classified as visitor arrivals by the 12/16-month rule.

# Summary of method and data

The 12/16 migration series, 2001–16, was developed in two stages – accessing border movements data from two sources held at Stats NZ, and using two methods for linking travel histories. The first stage prepared monthly migration estimates for the period January 2001– March 2015.

The second stage produced migration estimates for October 2014–March 2016. The two development stages of the migration series have allowed us to compare the series, by the two respective data sources and the two methods for linking travel histories.

The following points summarise the differences.

## 12/16 migration series – 2015 onwards

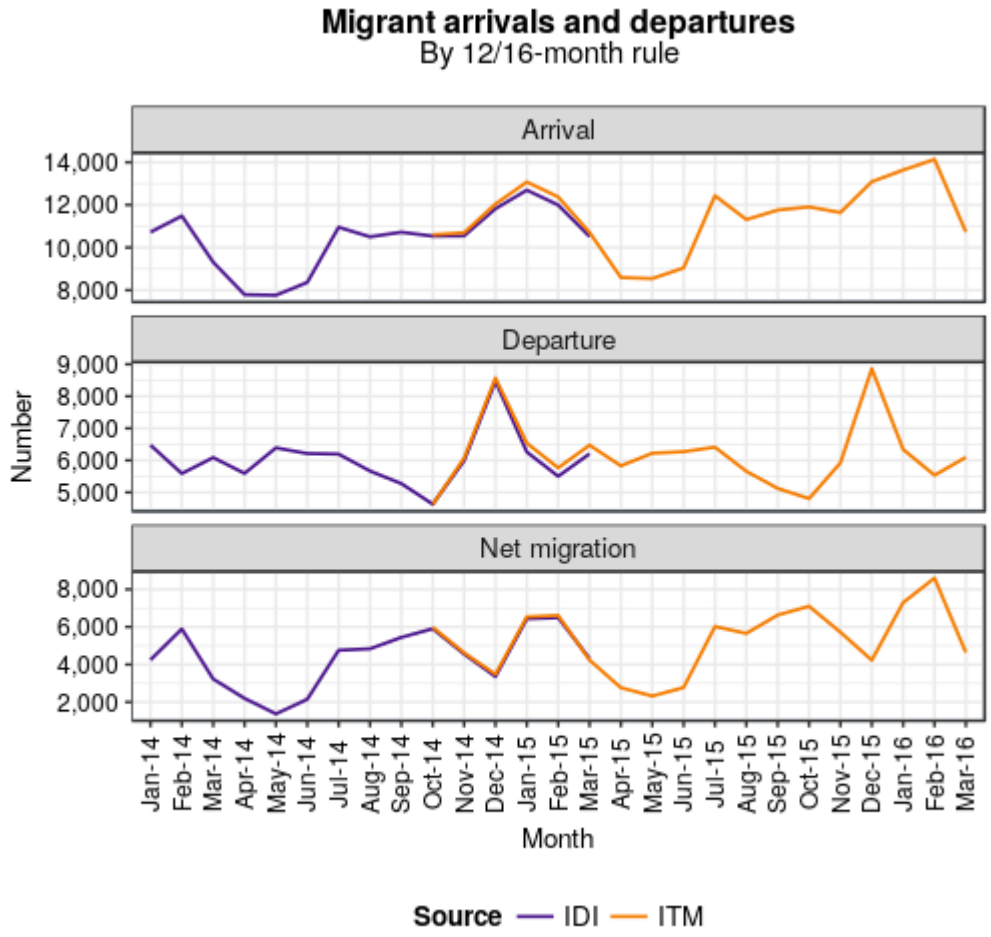
- The data source is the timely and regular electronic transfer of border movements and traveller identities to Stats NZ by New Zealand Customs, which allows us to produce the monthly international travel and migration (ITM) statistics. Travel histories for all travellers are accessible for border movements from June 2013 onwards. Before then traveller names were not recorded in the archived databases.
- The series use a deterministic method for grouping (de-duplication) travellers over time – using key identities such as first names, surname, date of birth, and passport code. Traveller IDs are assigned to derive travel histories efficiently, for input to processing the 12/16-month migration series.
- Different border movements are linked as the same passenger if: passport number and date of birth match
    - or full name and date of birth match
    - this method will fail to match movements where travellers have changed both their name and passport number
    - this method replicates the methodology currently employed by the official ITM processing system to provide indicative travel histories for manual assignment of traveller class.
- For building up an archive of resident status updates by the 12/16-month rule, we used the traveller card information for a 16-month period, June 2013–September 2014. Subsequently, we have estimated migrant arrivals and departures by the 12/16-month rule using the ITM source and method from October 2014 onwards.
- The methodology for linking border movements will be continually evaluated and refined.

## Historic series 2001–14

- The data source is the historic series of border movements and traveller identities available in the Stats NZ Integrated Data Infrastructure (IDI) by the IDI quarterly release cycle. Travel histories of all travellers, and their identities, are available from 1998 onwards.
- Subsequently, the first release of the historic 12/16-month migration series was produced for January 2001 – March 2015.
    - Due to the minimum 3-month time-lag of the releases of border movements in the Stats NZ IDI, the updates to the 12/16-month series was moved to the ITM production environment as described above.
- The historic series use a probabilistic de-duplication method for grouping travellers over time. Linking passes represent combinations of blocking and linking variables, using the IDI record identifier in the migration series, names, date of birth variables, sex, and nationality.

Defining migrants using travel histories and the '12/16-month rule' (appendix 2) has more details.

Figure 5




Source: Stats NZ

# How do series created from ITM data and IDI data compare?

Migration estimates for six months (October 2014–March 2015), based on the two data sources and methods for linking of travel histories, provided the basis for us to evaluate the quality and accuracy of the recent updates to the series (ITM) compared with the earlier released historic series (IDI) (figure 6). The numerical differences between the two were of an acceptably small magnitude.

Evaluating the quality assurance indicators, such as imputation rate for missing movements in travel histories, showed similar levels of quality between the ITM and IDI data series. We can reliably continue to update the 12/16-month series as part of the ITM outputs.

A direct comparison of the two migration series showed the new ITM series estimated arrivals to be around 2.0 percent higher than the first historic series (IDI), departures were 2.7 percent higher, and net migration around 1.3 percent higher. These figures represent averages over a six-month period where we were able to produce final migration estimates using the IDI and ITM data sources.

# What are the future developments of migration statistics?

The analysis in this report shows the outcomes-based measure is better suited to estimating migration levels when accuracy is the primary concern. However, a 17-month wait for migration measures is not always appropriate. Stats NZ is prioritising work to address this.

## Improving the timeliness of outcomes-based migration measures

The 12/16-month methodology of the outcomes-based migration measure will always carry a minimum associated lag of 17 months.

For this reason, Stats NZ is investigating methods and data sources for a more-accurate estimate of migration than the current PLT measure, but one that is also suitably timely.

These estimates will be generated through a probabilistic predictive model of traveller type (ie short-term traveller, or long-term migrant), based on available characteristics of travellers. Such a model will provide a provisional estimate of migration, which we can then revise (if required) as sufficient time passes for us to apply the outcomes-based measure. The migration statistics series will be extended to include both provisional and final estimates of migrant arrivals and departures.

## What we are trying to model

A modelling approach needs to extract the small number of migrant movements from the very large number of overall border movements. For example in the year ending June 2017 there were:

- 131,400 migrant arrivals, of 6.53 million arrivals (2.0 percent of all arrivals)
- 59,100 migrant departures, of 6.46 million departures (0.9 percent of all departures).

This shows the imbalance of the traveller type present in the border movements. This highlights the considerable challenges that exist in achieving the required level of precision when estimating migration through a modelling approach.

## Removing departure cards is being considered

Stats NZ is also progressing to use alternative data sources for producing departure statistics. Requiring departing travellers to fill in cards is viewed as a burden on traveller movements through airports, and on the operational public services staff who have to collect and process these.

The complete reliance on departure cards as a collection, and expecting to minimise their administration, have provided incentives to develop departure statistics that use other data sources combined with applied statistical methods.

The outcomes-based series, combined with the predictive model will form a key part in a solution to progress the elimination of the departure cards.

# Related information

Measuring international migration using travel histories – news story

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Select the following categories from the Infoshare homepage:

Subject category: Tourism

Group: International Travel and Migration

See tables:

- Estimated migrant arrivals and departures, 12/16-month rule
- Estimated migrants by age group and sex, 12/16-month rule
- Estimated migrants by country/ region of citizenship, 12/16-month rule
- Estimated migrant arrivals by visa type, 12/16-month rule
- Estimated migrant arrivals by visa type and country/ region of citizenship, 12/16-month rule

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