Prospective Life Course and Mobility of Young Victorians

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Abstract

Many studies have explored whether young adults are using cars less than previous generations. We now know that where reductions in car-based mobility have occurred, they are often linked to delays in adult life stage transitions among the millennial generation. What is not yet known is whether millennials will revert entirely to the car-based mobility of previous generations when they 'grow up'. This study is the first to measure the predicted future life course of young adults and link it to their travel behaviour and attitudes. It aims to explore the diversity of life paths among young adults, drawing from a survey of 885 21-25 year olds in Victoria, Australia. We found that young adults fell into one of five 'prospective life course segments' with distinct demographics, mobility patterns and attitudes. Although no-one can predict the future, the study provides additional insights into the diversity of life and mobility pathways among Australian millennials.

1. Introduction

In recent years there has been a significant interest in the travel behaviour of young adults in the millennial generation (also called generation Y). Many studies have found that compared to past generations, young adults are taking longer to get a driving license and are less car-dependent. These changes are closely linked to delays in life course milestones experienced by many young adults. This raises one of the greatest unknowns in this research – once young adults 'grow up', will they continue to maintain more sustainable travel than previous generations, or will they revert to the car-based mobility of previous generations?

This paper explores the diversity of life courses among young adults and how it relates to their mobility characteristics. It draws from a questionnaire survey of 21-25 year olds in Victoria, Australia. We use a latent class analysis to classify respondents into five different segments based on a prospective measure of their future life course. We then compare the mobility attitudes and travel behaviour of the five segments.

2. Literature Review

The millennial generation is the largest living generation and is now aged between 18 and 37. Due to their size they are likely to shape the demand for our transport systems into the future, especially as they transition through 'adult' milestones such as getting a job, a home, a partner and children. Recent research suggests that the millennial generation is taking longer to get a driving license (Delbosc and Currie, 2013, Hjorthol, 2016, Thigpen and Handy, 2018), they are owning fewer cars and driving less (Klein and Smart, 2017, Oakil et al., 2016, McDonald,

2015) and they are using public transport more than previous generations (Grimsrud and El-Geneidy, 2014, Kuhnimhof et al., 2011). Although these findings are not universal (with American studies forming the most notable exception, see for example (Ralph, 2016, Klein and Smart, 2017, Klein et al., 2018)), they are promising enough to suggest a brighter future for sustainable transport.

However, there is an ongoing question of whether these changing travel patterns are only temporary. The most enduring explanation for changes to millennial travel behaviour is that millennials are taking longer to reach key life transitions. Millennials are more likely to study at university than past generations and they are taking longer to marry and have children (Settersten Jr and Ray, 2010, Australian Bureau of Statistics, 2012, Taylor et al., 2012). This delay reduces the need for car-based mobility (and limits the ability to pay for it) until later in life (Delbosc and Currie, 2014a, Hjorthol, 2016, Newbold and Scott, 2017, Chatterjee et al., 2018).

Many studies have explored the link between travel behaviour and life transitions (see Scheiner, 2018 for a review). Some work in this area strongly suggests that when millennials 'grow up,' they will revert to the car-based mobility of previous generations (Newbold and Scott, 2017, Klein and Smart, 2017, Brown et al., 2016). Yet other work suggests that this generation of parents is retaining more sustainable travel behaviours than in the past (Grimsrud and El-Geneidy, 2014, McCarthy et al., 2018, Guthrie and Fan, 2016). It is not yet clear which of these two futures is more likely to occur.

So far these studies have had to look to the past to predict the future, either through retrospective surveys (e.g. Jones et al., 2014, Schoenduwe et al., 2015) or looking over time at longitudinal studies (e.g. Prillwitz et al., 2007). Far fewer studies have asked young adults to predict their *future* life course and how it might interact with travel behaviour. There is a body of research asking adolescents or young adults to predict their *future travel behaviour* (e.g. Luke, 2018, Sigurdardottir et al., 2013, Line et al., 2010). Yet as far as the authors are aware, only one study has asked young adults to reflect on their possible *future life course* and how this might intersect with their travel behaviour. This study used in-depth qualitative interviews to map out prospective life courses of millennials in Melbourne (Delbosc and Nakanishi, 2017). The interviews identified three prototypical life courses: traditional (planning to have children before age 30), delayed (planning to have children after age 30) and non-traditional/uncertain (uncertain when or if they would marry or have children). However it was not clear how representative these life course paths were across the population.

This paper builds from this line of research by exploring the relationship between prospective life course transitions and the travel of millennials in Victoria. It will use quantitative methods (latent class analysis) to classify millennials into prospective life course segments and relate these segments to various aspects of travel attitudes and behaviours.

3. Research Method

3.1 Data collection

This analysis draws from a bespoke survey of young adults aged 21 to 25 living in Victoria, Australia. This age window was chosen because it is the stage when young adults tend to finish schooling, move into the workforce and begin to marry and/or have children (see Figure 1).

Figure 1: Life transitions among Victorian millennials (source: ABS Census 2011)
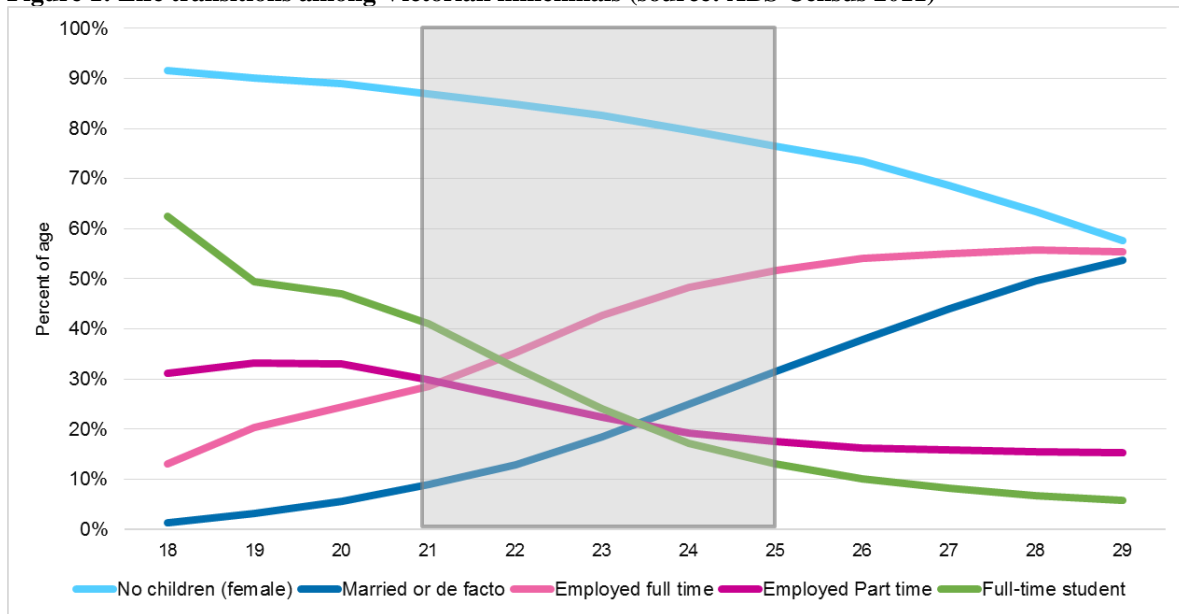
The survey data collection was conducted in 2017 from May to July. Five different recruitment methods were pursued for this study because of an anticipated difficulty in recruiting young adults. These included:

- RACV (Royal Automobile Club of Victoria) newsletter.
- In-person recruitment from Holmesglen TAFE (Technical and further education) (to increase representation by non-university students).
- Three civil engineering undergraduate students from Monash University helped in recruiting participants as part of their final-year project. They used personal social networks, a car club membership and a work email list.
- A targeted social media campaign was distributed by market research company Ipsos.
- Computer-Assisted Telephone Interviewing (CATI) was also implemented by Ipsos.

The most effective recruitment methods were the social media and CATI sources (see Table 1). Overall, 21 responses were deemed to be skimmers (someone who gave the same response to the entire bank of questions where it is not logical) and removed. The field work resulted in a total of 885 useable responses. This included 673 from Metropolitan Melbourne and 200 from Regional Victoria as well as 12 who did not provide a postcode.

Table 1: Survey sampling results

Recruitment source	Initial responses	Responses with skimmers removed
RACV newsletter	31	31
Holmesglen TAFE	8	7
Final-year student project	63	61
Social media campaign	394	382
CATI	410	404
Total	*906*	*885*

The survey contained a range of questions including:

- Likelihood of reaching life course milestones in the next 12 months, 3 years and by the age of 30 (see next section for full description)
- Use of different modes in the last 7 days

- Accessibility to key destinations by different modes ('Where you live, how easy or difficult is it for you to get to the following places …', rated on a five-point scale from 'very easy' to 'very difficult')
- Attitudes to different transport modes (rated on a five-point scale from 'strongly disagree' to 'strongly agree') Some of these questions were taken from Thigpen and Handy (2018) and Delbosc and Currie (2014b).
- Perception of future household location (rated on a five-point scale from 'strongly disagree' to 'strongly agree')
- Personal and household demographics

The analysis in this paper centres on a latent class analysis (LCA) to classify participants into prospective life course segments based on their likelihood of reaching some life course milestones.

3.2 Latent class analysis

Latent class analysis (LCA) is a type of modelling approach that uses unobserved categorical variables to find homogeneous subgroups or classes in a dataset based on observed or manifest variables (Haughton et al., 2009, Kaplan, 2004). Latent class analysis is used in this study to classify a group of young adult respondents (age 21 to 25) based on their prospective life course milestones.

Cluster analysis (either hierarchical or k-means) was considered as the standard statistical tool for identifying groups in data for many years (Eshghi et al., 2011). However, for this study LCA analysis is chosen over the cluster analysis due to the fact that cluster analysis often relies on the ad-hoc and deterministic classification method to identify homogeneous clusters, whereas LCA is a model-based clustering technique which probabilistically assigns individuals to classes/clusters. This reduces misclassification biases (Molin et al., 2016). The additional benefit of using LCA is that this models can work with a wider range of data types—namely nominal, ordinal and count data (Magidson and Vermunt, 2002). In addition, various diagnostic methods are available in LCA to assist in determining of the optimal number of clusters (Haughton et al., 2009).

The basic latent class cluster model is given by (Haughton et al., 2009):

$$P(y_n|\theta) = \sum_1^S \pi_j \, P_j(y_n|\theta_j)$$

where y_n is the nth observation of the manifest variables, S is the number of clusters, and π_j is the prior probability of membership in cluster j. P_j is the cluster specific probability of y_n given the cluster specific parameters θ_j. Maximum likelihood estimates are generally been used to classify cases based upon their posterior probability of class membership.

Several approaches are available for assessing the fit of LC models. A common approach is to use likelihood ratio chi-squared statistic L^2, in which the observed cell frequencies are compared with the model-implied cell frequencies for the various response patterns under the null hypothesis that the difference between the two sets of frequencies is zero (Molin et al., 2016). The lower the value of L^2, the better the fit of the model to the data (Kaplan, 2004). If there are many possible response patterns (sparse data), many observed cell frequencies will be zero and the chi-squared statistic will no longer approximate a chi-squared distribution. In

the case of sparse data, an information criterion weighting is used for both model fit and parsimony. Such measures are Akaike's information criterion (AIC), Bayesian information criterion (BIC) and 'consistent' AIC (CAIC) and especially useful in comparing models.

Both indicator variables (future life course estimates) and covariates (personal and household demographics) were included to identify the number of exclusive and exhaustive clusters in data. Including active covariates in to the model improved the classification of each case into the most likely segments and reduced classification error (Vermunt and Magidson, 2005, Haughton et al., 2009).

Indicator variables were participants' responses to a set of life-course milestones. Participants were asked whether a series of life events occurred in their past or were likely to occur in the future. The milestones included:
- Get P-plates
- Have your own car
- Get a part-time job
- Get a full-time job
- Move out of your parent's home
- Move in with a partner
- Buy a home
- Get married
- Have children

The responses were recorded on a scale of 0 to 11, with 0 being 'no chance', 10 being 'certainty' and 11 being 'already done'. For ease of interpretation, these values were reduced to five categories:
- No chance (0)
- Below-even chance (1 to 5)
- Above-even chance (6 to 9)
- Certainty (10)
- Already done (11)

The question set was repeated three times to measure respondents' certainty of these actions taking place over the next 12 months, 3 years and before the participants turn 30. Therefore, 27 variables (each with five categories) were entered into the latent class analysis. The covariates included participants' gender, highest level of education, whether they and/or their parents were born in Australia, individual income level and their location (either metropolitan Melbourne or regional Victoria). The software package Latent Gold 5.1 was used to estimate the clusters (Vermunt and Magidson, 2016). Missing values were treated with option 'include all' in Latent Gold software.

3.3 Factor analysis of attitude variables

Attitudes can play an important role in influencing travel behaviour and intentions. For this reason, this study asked a range of attitude questions towards different aspects of transport, including car licensing, car ownership responsibilities and public transport. The responses to each attitude statement were recorded on a scale of 1 to 5, with 1 being "strongly disagree" and 5 being "strongly agree". To reduce the number of questions in this analysis, a factor analysis was conducted to reduce seventeen attitude questions to a smaller number of attitude 'factors'.

Factor analysis outcomes showed that the value of Kaiser-Meyer-Okin measure as 0.794 which presents that the sample size is large enough to reliably extract factors (Field, 2013). Also, Bartlett's test appeared to be highly significant (approximate $X^2(136) = 3153$, $p<0.001$) which suggests that factor analysis is highly appropriate for this data (Field, 2013).

Based on eigenvalue greater than 1, five factors were retained first. However, one factor was only describing one variable. Therefore, four factors were opted to be the optimum number of factors and can explain 49.1% of total variance in the data. The interpretability of factors were improved through rotation which maximises the loading of each variable on one of the extracted factors. Varimax, a form of orthogonal rotation method, was adopted assuming that the factors are independent. Table 2 shows the rotated component matrix. Factor loading greater than 0.40 is only displayed.

Table 2: Rotated component matrix

Variables	Factor loading			
	Factor 1	Factor 2	Factor 3	Factor 4
Taking public transport, walking and cycling meet my travel needs	.821			
I don't need a car to get around	.787			
It is easy to use public transport where I live	.731			
I like taking public transport	.668			
I like walking or riding my bike	.538			
Getting a license is just too hard		-.706		
My parent(s) encouraged me to get a driving license		.687		
I got my driving license as soon as possible		.627		
Before I could drive, my parent(s) allowed me to go places on my own		.406		
What kind of car you own says a lot about who you are			.682	
Getting a car is part of growing up			.679	
I like the idea of driving			.540	
A car is a big responsibility			.488	
Most of my friends drove or were driven to school				.738
Driving was the coolest way to get to school				.554
My friends got their license as soon as possible				.545
I can rely on other people to drive me places				.461

The factors were labelled as: 1) sustainable transport, 2) getting a license, 3) car ownership status and 4) peer influence. Later in this paper, these four factors will be compared across the different life course segments.

4. Results

4.1 Respondent characteristics

Table 3 presents some key respondents demographics from the survey and the comparison with the 2016 census for Victorians aged 21 to 25, to check the representativeness of the survey results. Results show that the survey sample is somewhat similar with a few key differences. Participants have a higher proportion of females compared to the census (60.2% compared to 49.5%). The proportion of young Australians born overseas was higher in the census (35.2%)

compared to the survey sample (14.8%). Survey participants were more likely to be employed and have a higher degree, suggesting that we under-sampled university students.

Table 3: Respondents Characteristics

	MMPS survey (N)	MMPS survey (%)	2016 Census Victoria* (%)
AGE			
21	169	19.1	19.5
22	191	21.6	19.6
23	193	21.8	20.0
24	169	19.1	20.2
25	163	18.4	20.7
Total	*885*	*100.0*	*100.0*
GENDER			
Male	352	39.8	50.5
Female	533	60.2	49.5
COUNTRY OF BIRTH			
Self and parents born Australia	494	55.8	42.0
Born in Australia to non-Australian parents	260	29.4	22.8
Born Overseas	131	14.8	35.2
EMPLOYMENT STATUS			
Employed Full-Time	340	38.4	33.6
Employed Part-Time	309	34.9	26.2
Not Employed	236	26.7	40.2
PERSONAL INCOME (before tax)			
None/Nil	44	5.0	13.3
$1-$399 per week ($1-$20,799)	270	30.5	23.9
$400-$999 per week ($20,800-$51,999)	364	41.2	39.9
$1,000-$1,499 per week ($52,000-$77,999)	157	17.7	12.2
$1,500 or more ($78,000 or more)	28	3.1	2.8
Not Stated/ Unknown	22	2.5	8.0
None/Nil	44	5.0	13.3
HIGHEST LEVEL Of EDUCATION			
Less than Year 12 Certificate	33	3.7	11.6
Year 12 Certificate	272	30.7	53.6
Trade qualification (diploma, certificate)	230	26.0	16.7
University bachelor's degree	311	35.1	16.1
Post-graduate study (e.g. Masters, PhD)	39	4.4	1.9
PLACE OF RESIDENCE			
Metro Melbourne	673	76.0	81.1
Regional Victoria	200	22.6	18.9
Not Stated/ Unknown	12	1.4	-

Only includes those aged 21-25

4.2 Life Course Segmentation Results

Table 4 presents the fit of consecutive latent class analysis models starting with a model with one class up to a model with seven classes. Chi-square test is not appropriate when the number of input variables is large (in this case, 27 variables with 5 categories); therefore we chose to evaluate the models based on the information criterion measures, which weigh both model fit and parsimony (Molin et al., 2016).

Table 4 presents the evolution of BIC, AIC and CAIC for all the models. Results show that all three information criterion decreases with the increase in number of clusters until cluster 5. Afterward, AIC continued to decrease, however BIC and CAIC increased. Literature

suggested, in the context of latent class analysis, the Bayesian information criterion (BIC) has been shown to perform well (Nylund et al., 2007) and the guideline is to select the solution for which the BIC is lowest. Therefore, the model with 5 clusters is selected for this study.

Table 4: Fit statistics from latent class analyses

| Model no	No of classes	L^2	BIC(LL)	AIC(LL)	CAIC(LL)	N_{par}	df	p-value	Class. Err.
Model1	1-Cluster	52461.6	55604.3	55087.4	55712.3	108	777	0.000	0
Model2	2-Cluster	48133.9	52138.4	51013.8	52373.3	235	650	0.000	0.023
Model3	3-Cluster	45854.7	50720.9	48988.5	51082.9	362	523	0.000	0.018
Model4	4-Cluster	44182.9	49910.9	47570.7	50399.9	489	396	0.000	0.017
Model5	5-Cluster	42886.4	49476.1	46528.2	50092.1	616	269	0.000	0.015
Model6	6-Cluster	42141.5	49593.0	46037.3	50336.0	743	142	0.000	0.014
Model7	7-Cluster	41402.3	49715.6	45552.1	50585.6	870	15	0.000	0.019

Figure 2 shows the results of the five-cluster latent class analysis. The five clusters differed significantly not just in their current life situation, but in their vision of near and long-term future. After a careful consideration of the clusters' characteristics, these five segments were named as: 1) Traditional (24% of the sample), 2) Launching Traditional (20% of the sample), 3) Independent (19% of the sample), 4) Delayed without Cars (16% of the sample) and 5) Delayed with Cars (21% of the sample).

Participants in segment 1 (**Traditional**) showed a very traditional life course progression. Almost all of them were working, had moved out of their parents' home and were living with a partner. Around 20% had already bought a home, married and/or had children, and for those that hadn't at this stage was on the near horizon. Almost everyone in this segment had a driving license and if they did not already have a car, they were certain to get one within the next year.

Segment 2 (**Launching Traditional**) were given this name because they were on the cusp of becoming more independent, but with a long-term view toward a traditional future. Their defining characteristic is that none had yet moved out of their parents' home, but most intended to do so within the next 12 months. They were in the middle of transitioning into the workforce with over half already working and the rest intending to do so within 12 months. Over 60% thought there was an above-even chance or certainty that they would buy a home within 3 years and although marriage and children were not on the near horizon for most, the majority saw themselves reaching this milestone by 30.

Segment 3 (**Independent**), like the Traditional segment, were working, living away from their parents and most had a car. However a much smaller proportion were living with a partner (around 20%) and very few had a home or children. These milestones were not on the near horizon for most – fewer than 25% thought there was an above-even chance of moving in with a partner or buying a home in the next 3 years and less than half thought there was an above-even chance of marrying or having children by age 30.

Figure 2: Five prospective life stage segments
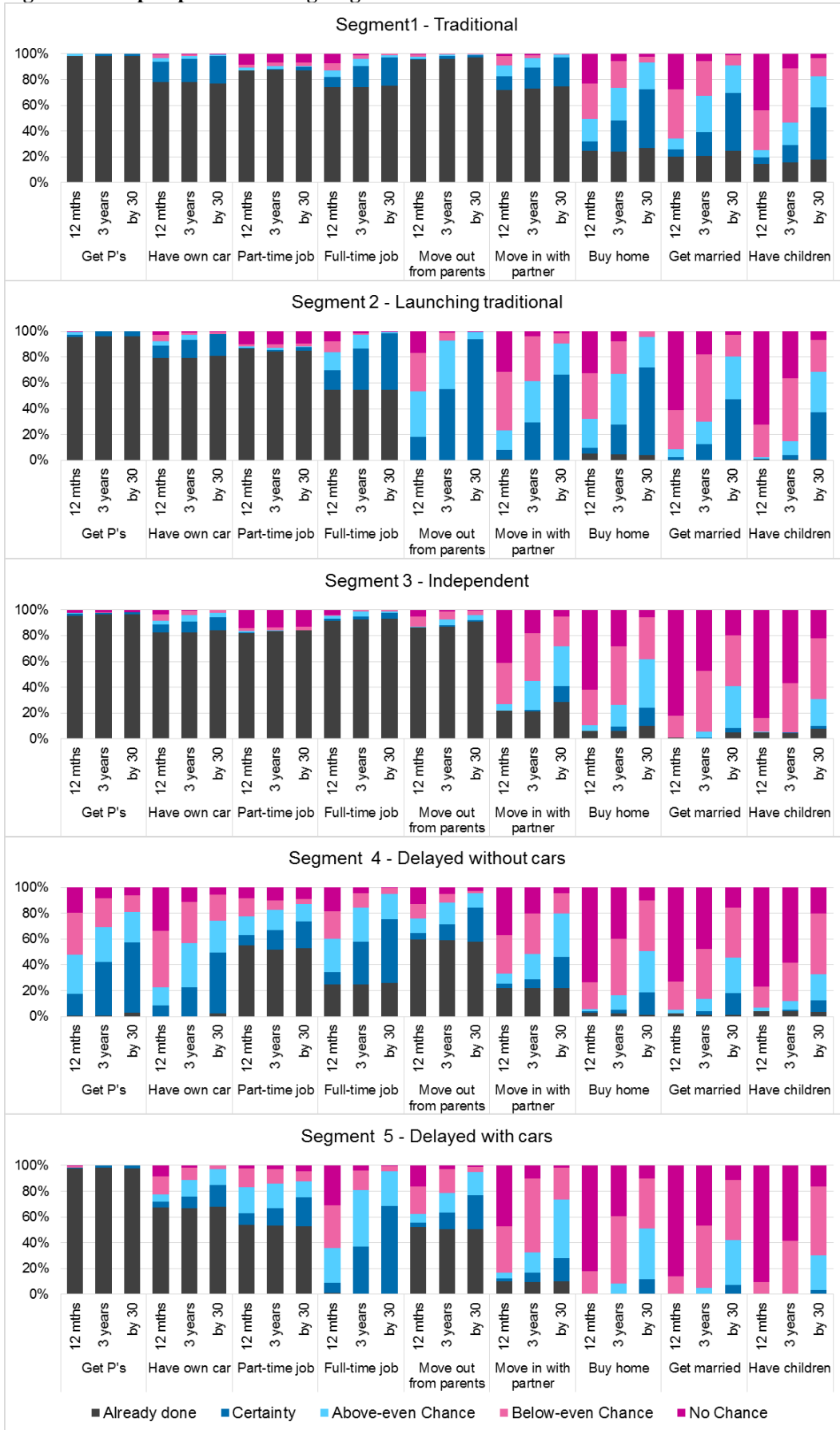
The final two segments were both called 'Delayed' because many had not yet transitioned into full-time work or moved out of their parents' home. However they both shared many long-term goals with the Independent segment; they were not certain about buying a home, getting married or having children, even by the time they reached 30.

The distinguishing characteristic between the two 'Delayed' segments was their relationship to cars. Segment 4 (**Delayed without Cars**) was the only segment where they did not yet have an independent driving license or own a car, although this transition was in the medium-term horizon for most. In contrast, Segment 5 (**Delayed with Cars**) almost all had their license and over 60% already had their own car. They were less likely to have a full-time job or live with a partner compared to the Delayed without Cars segment, but otherwise they were very similar.

The five segments also varied somewhat in their demographic characteristics (see Figure 3). The Traditional segment was more likely to be female, employed full-time, live in Regional Victoria and live with a spouse or partner. They were also the most likely segment to be second-generation Australians.

The Independent and Launching Traditional segments were both rather demographically 'average', although they were slightly more likely to be male and had a slightly higher income. The Launching Traditional segment was by far the most likely to live with parents and were slightly more likely to be first-generation Australians.

The two Delayed segments were demographically similar in that they were more likely to be studying and low-income. Participants in the Delayed without Cars segment were the most likely to be born overseas (29% compared to 14% of survey respondents).

**Figure 3: Demographics of life stage segments**
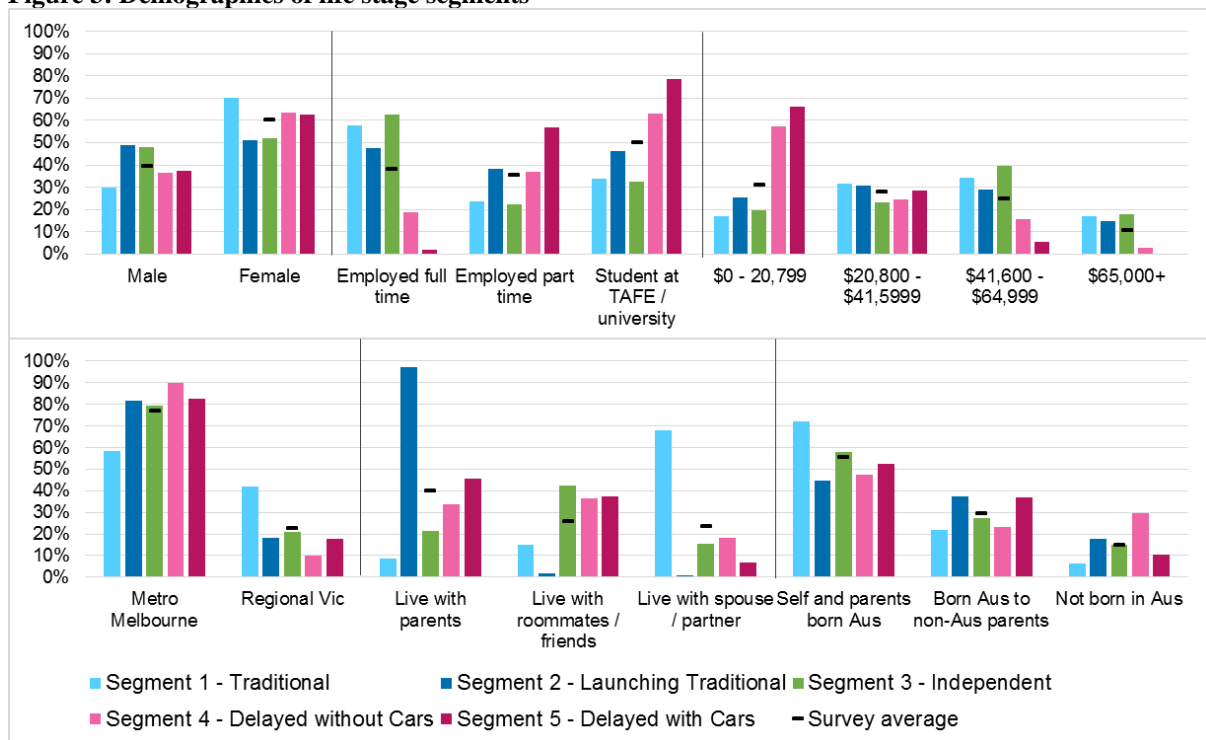
5. Life course, mobility and attitudes

5.1 Mode use and accessibility

This section explores how five life stage segments show different patterns of mode use and accessibility.

To measure general exposure to different modes, participants were asked how many days in the last 7 they used different transport modes. Figure 4 shows the average frequency of using different modes of transport in last seven days, compared across the five segments. Overall, driving was the most common mode used (more than 4 days in the last 7), followed by walking, public transport, being driven and cycling. The five segments showed very different patterns of mode use, most notably segment 5 (Delayed without Cars) which showed the most walking, public transport, lift-taking and cycling. The Independent and Delayed with Cars segments showed slightly more multi-modal behaviour whereas the Traditional and Launching Traditional segments were the most likely to drive. A series of one-way ANOVAs showed statistically significant differences between groups for all five modes (drove a car: $F(4) = 160.4$, $p < .05$, driven by someone else $F(4) = 8.2$, $p < .05$, took public transport $F(4) = 26.7$, $p < .05$, walked somewhere $F(4) = 60.0$, $p < .05$ and rode a bicycle $F(4) = 5.6$, $p < .05$).

Figure 4: Frequency of different transport mode use segments
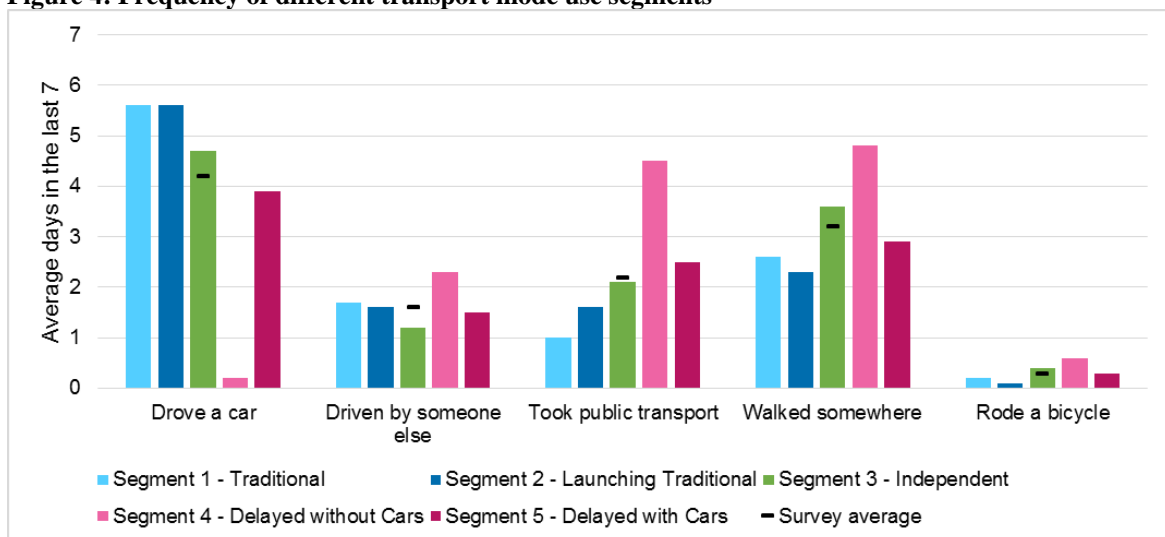
Participants were also asked how easy or difficult it was to reach key destinations by different travel modes, creating a subjective measure of 'accessibility' (see Figure 5). The accessibility of different modes was a close reflection of the modes used by segments. For all segments except Delayed without Cars, locations were most accessible by cars, followed by transit, then walking or cycling. The Delayed without Cars segment was far more likely to live somewhere with highly accessible transit and fairly accessible by walking and cycling. One-way ANOVAs showed statistically significant differences between groups for all three modes (accessible by car: $F(4) = 6.9$, $p < .05$, accessible by public transport $F(4) = 25.7$, $p < .05$, accessible by walking or cycling $F(4) = 13.1$, $p < .05$).

**Figure 5: Average rate of location accessibility by segments**
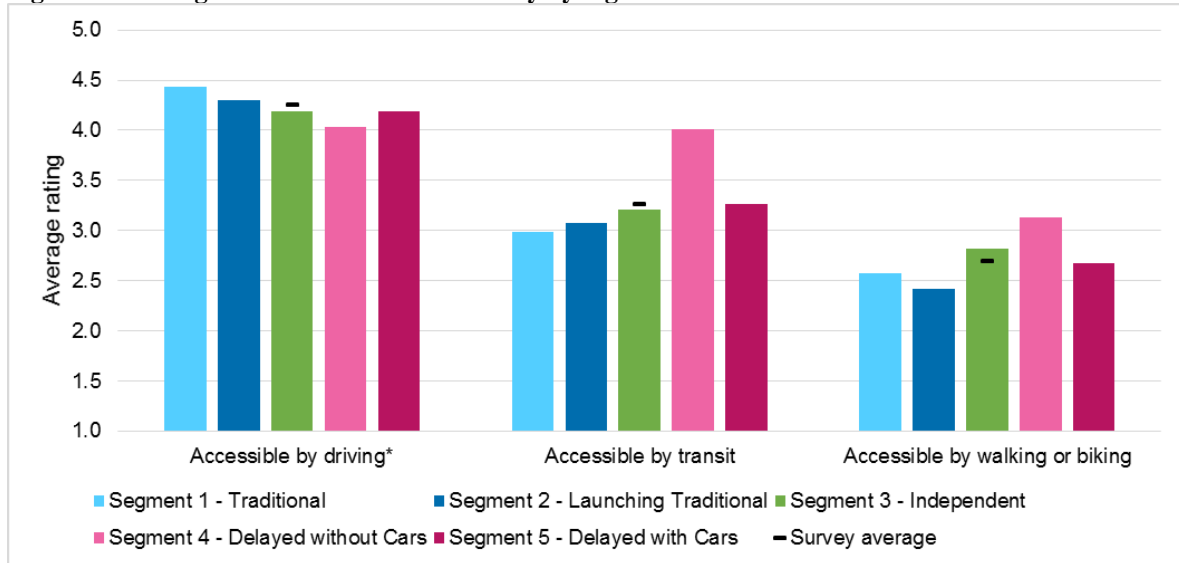
Note: Because so few in Segment 4 could drive, for this segment we show their rating for 'being driven' to places.

5.2 Future home location

Although Figure 6 shows the accessibility of participants' current home location, many young adults will move their home in the future. We also asked participants to rate how much they were willing to settle into different home locations, including the suburbs, somewhere close to public transport and an inner-city neighbourhood or town centre. In Figure 6, we see that overall, suburbs are slightly favoured over inner-city areas and that it was common to want to live near good public transport. The Launching Traditional segment was the most likely to want to live in the suburbs and both Delayed segments preferred busier areas. The Traditional segments were both the least likely to prefer living close to good public transport. These differences were confirmed with three sets of one-way ANOVAS (settling in the suburbs: $F(4) = 9.3$, $p < .05$, living close to public transport: $F(4) = 32.1$, $p < .05$, busy neighbourhood: $F(4) = 39.4$, $p < .05$).

**Figure 6: Average rate of segments future settlement decision**
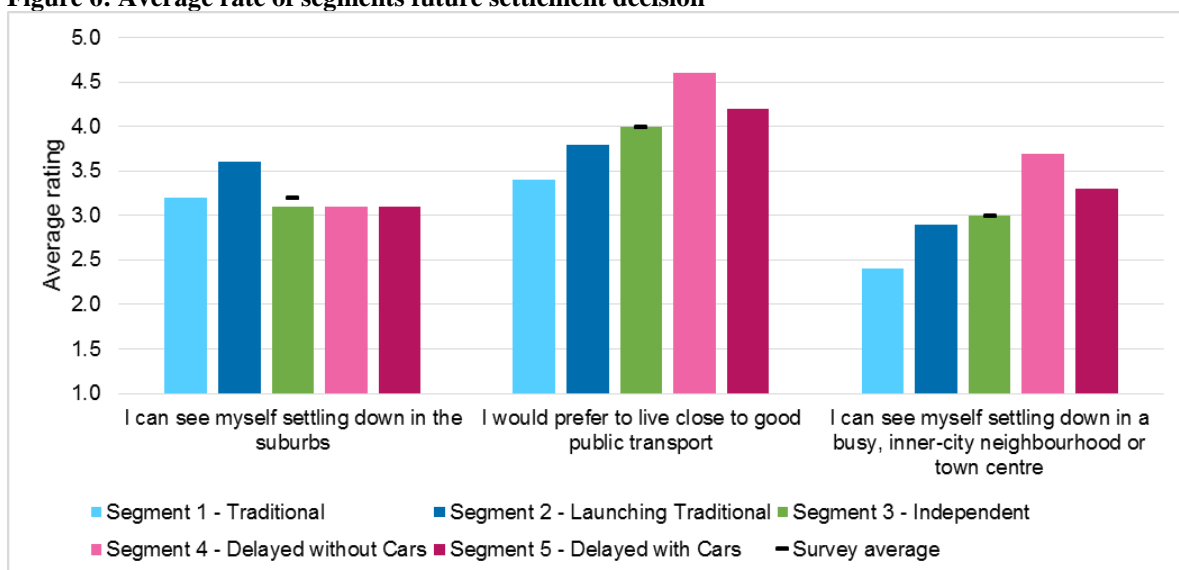
5.3 Attitudes

This section explores whether the five life stage segments show different attitudes towards transport. It draws upon the set of attitude scales that were reduced down into four attitude factors in section 3.3: 1) sustainable transport, 2) getting a license, 3) car ownership status and 4) peer influence.

Figure 7 shows the average factor scores across the five segments. These factor scores are expressed as standardised z-scores. The Delayed without Cars segment showed by far the most positive attitudes towards using sustainable transport and negative attitudes toward getting a license and car ownership status. The Traditional and Launching Traditional segments showed fairly similar attitudes which were more negative to sustainable transport and positive to getting a license and car status. Peer influence ratings were fairly similar across the groups except for the Traditional segment which was more positive than the Delayed segments. One-way ANOVAs showed statistically significant differences between segments for all four factors (sustainable transport: $F(4) = 37.1$, $p < .05$, getting a license: $F(4) = 53.9$, $p < .05$, car ownership status: $F(4) = 11.6$, $p < .05$, peer influence $F(4) = 4.9$, $p < .05$).

Figure 7: Average rate of travel attitudes by segments
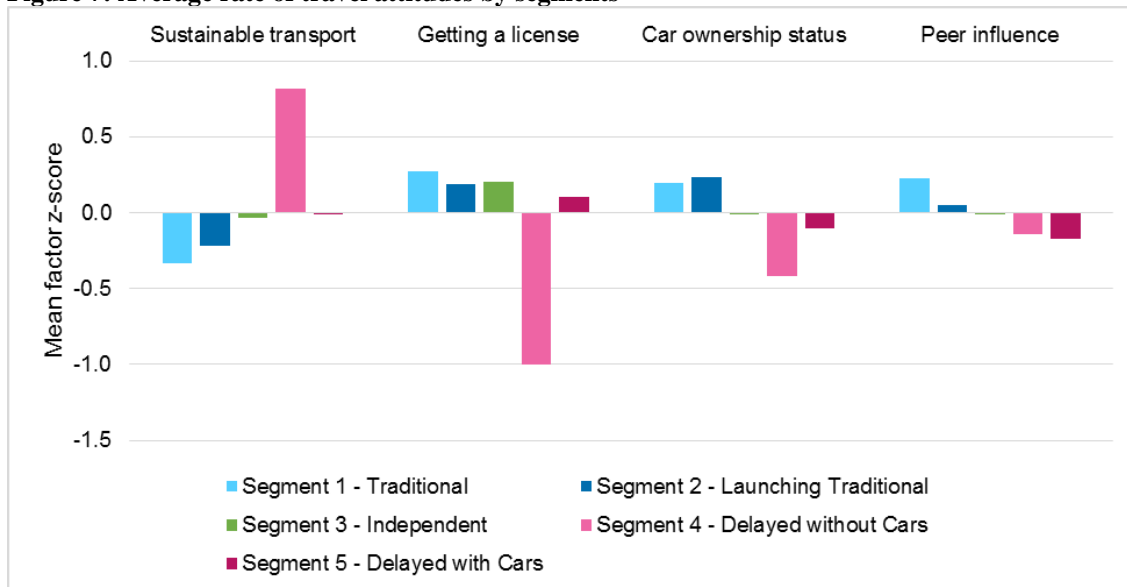

6. Discussion

As the research into millennials' matures, we are gaining a far more nuanced understanding of the reasons behind their travel behaviour. Millennials, like all generational cohorts, are a diverse group; whether or not their travel behaviour is becoming more sustainable depends on their gender, race, income, life stage and where they live (Klein et al., 2018, Ralph et al., 2016, Delbosc and Currie, 2014a). This study is the first to examine this diversity of travel behaviour through the lens of their future life course trajectory.

We uncovered five different 'prospective' life course segments based on respondents' current and future life stage. These segments are summarised visually in Figure 8. Different millennials are on different life paths, both at present and into the future. This diversity of life paths suggests that transport planning and policy should take different approaches for different segments of the young adult population.

Figure 8: Prospective life course segment trajectories
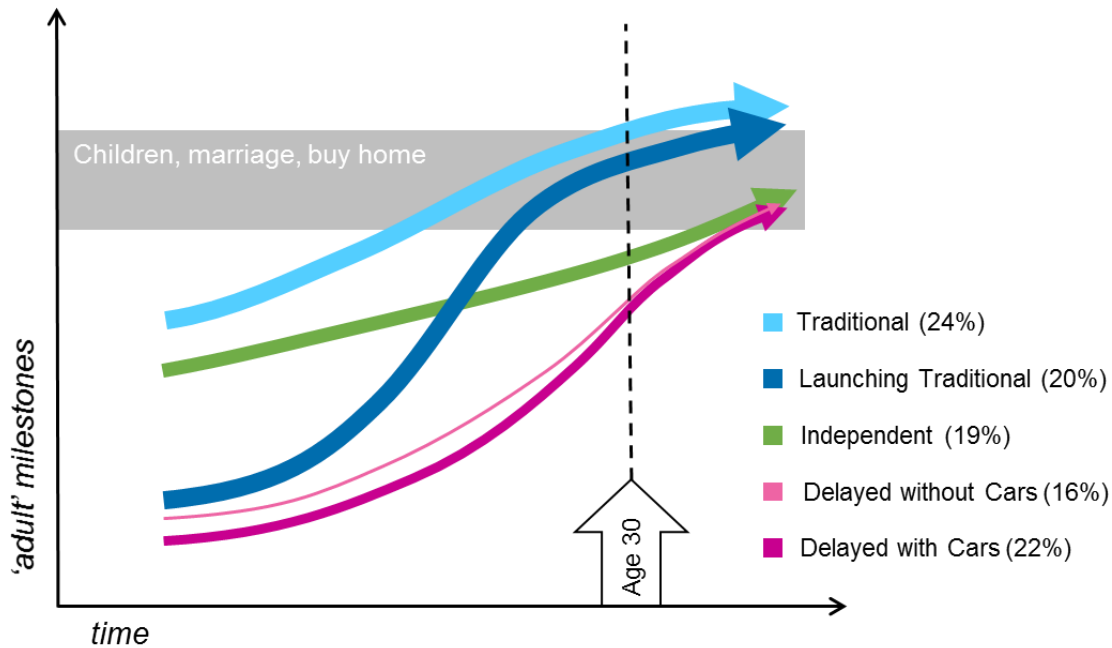
Note: Thicker lines represent greater use of cars in the present. Percentages show proportion of the sample in each segment.

The characteristics and policy implications for the five segments are summarised in Table 5. The two most 'traditional' life paths, which made up 44% of the sample, were most closely associated with car use, negative attitudes to sustainable transport and an attraction to living away from busy inner-city areas. These segments are not the stereotype of the 'multimodal millennial' and are likely to continue with the car-dependent lifestyle of previous generations of Australians. Their travel and housing location preferences are already fairly well served in Melbourne's suburbs and Victorian regional areas.

The Independent segment (19% of the sample) had reached many life milestones, such as owning a car and working full-time, but were not in a hurry to reach traditional family milestones. Although they tended to use the car almost as much as the Traditional segments, they were more multi-modal and preferred to live in transit-accessible areas more than the traditional segment. They shared many transport characteristics with the Delayed with Cars segment (22% of the sample), who were even more multi-modal and more likely to prefer busy neighbourhoods closer to transit. The Delayed with Cars segment were the most likely to be university students and may transition into a more 'independent' life stage when they finish their study. Like the Independent segment, most think it unlikely they will start a family or buy a home before they are 30. These segments, making up a combined 40% of the sample, are likely to benefit from policies that support their multi-modal lifestyle. And although starting a family is not on their immediate horizon, they may struggle to afford appropriate housing in the accessible areas they prefer when they do increase the size of the household.

The segment closest to the stereotype of the car-free millennial, Delayed without Cars, made up 16% of the sample. They shared some demographic characteristics with the Delayed with Cars segment, but their transport characteristics were unique in the survey – only 1% could drive independently, their travel was dominated by public transport and walking, and they were far more likely to live in transit- and walk-accessible neighbourhoods. Their attitudes are far

14

more favourable to sustainable transport and they prefer to live in transit-rich, busy neighbourhoods in the future. Interestingly, 29% of this segment were not born in Australia, more than twice as high as any other segment. It may be that the latest wave of young migrants to Australia are bringing a different set of travel habits and expectations to Australian cities.

This segment of the population, although it makes up the smallest in the sample, are likely to provide the greatest potential for supporting sustainable travel habits in the medium to long term. Around 40% of this segment don't have firm plans to get a license or a car before they turn 30 and they would rather live in accessible, inner-city areas. The longer they can delay (or forgo) reliance on private vehicle use, the stronger their sustainable travel habits will be. Yet like the Independent and Delayed with Cars segment, they are likely to run into issues with affordable, accessible housing when they do eventually start a family.

Table 5: Summary of potential policy implications of prospective life course segments

Prospective life course segment	Drivers to using alternate modes	Short-term constraints to using alternate modes	Policy options	Long-term car use
Traditional (24%)	None	Family duties, suburban/rural location, strong car use and attitudes	Few	Very high
Launching Traditional (20%)	None	Suburban location, strong car use and attitudes	Few	Very high
Independent (19%)	Prefer transit-rich and inner-city areas, somewhat multi-modal	Fairly strong car use	Support multi-modal travel, provide family housing in accessible areas	High
Delayed without Cars (16%)	Live in accessible areas, strongest preference for transit-rich and inner-city areas, heavy transit use, strong transit attitudes, low intent to get a car	None	Reinforce alternative modes in accessible areas, provide family housing in accessible areas	Moderate
Delayed with Cars (22%)	Prefer transit-rich and inner-city areas, somewhat multi-modal, university students	Fairly strong car use	Support multi-modal travel, provide alternative options around universities, provide family housing in accessible areas	High

Source: Adapted from (Anable, 2005)

Like all studies, this survey has its limitations. Although respondents are providing their estimated future life plans, no-one can perfectly predict their own future. For example, some of the Launching Traditional segment may not end up purchasing a home or starting a family until well into their 30s; conversely some of the Delayed segments may unexpectedly find their life partner or start a family within a year. In addition, we do not yet know how these prospective life course segments relate to long-term mode use, especially when the Delayed or Independent segments do eventually start a family.

In this case, this study is only the first in a series of longitudinal surveys that will return to this same group of young adults. In future waves we will be able to determine whether these life

trajectories influence long-term mobility, and whether or not life transitions influence travel habits in the same way across all segments.

In summary, this study joins the growing body of research showing that millennials are a diverse cohort. This diversity results in a range of travel needs both at present and into the future. A more nuanced understanding of their differences will help to better plan for the future of our transport system.

7. Acknowledgements

References

Anable, J. 2005. 'Complacent Car Addicts' or 'Aspiring Environmentalists'? Identifying travel behaviour segments using attitude theory. *Transport Policy,* 12**,** 65-78.

Australian Bureau of Statistics 2012. Australian social trends 2012: Love me do. Commonwealth of Australia.

Brown, A. E., Blumenberg, E., Taylor, B. D., Ralph, K. & Turley Voulgaris, C. 2016. A Taste for Transit? Analyzing Public Transit Use Trends among Youth. *Journal of Public Transportation,* 19**,** 4.

Chatterjee, K., Goodwin, P., Schwanen, T., Clark, B., Jain, J., Melia, S., Middleton, J., Plyushteva, A., Ricci, M., Santos, G. & Stokes, G. 2018. Young People's Travel – What's Changed and Why? Review and Analysis UWE Bristol, UK: Report to Department for Transport.

Delbosc, A. & Currie, G. 2013. Causes of youth licensing decline: a synthesis of evidence. *Transport Reviews,* 33**,** 271-290.

Delbosc, A. & Currie, G. 2014a. Changing demographics and young adult driver license decline in Melbourne, Australia (1994-2009). *Transportation,* 41**,** 529-542.

Delbosc, A. & Currie, G. 2014b. Impact of Attitudes and Life Stage on Decline in Rates of Driver's License Acquisition by Young People in Melbourne, Australia. *Transportation Research Record,* 2452.

Delbosc, A. & Nakanishi, H. 2017. A life course perspective on the travel of Australian millennials. *Transportation Research Part A: Policy and Practice,* 104**,** 319-336.

Eshghi, A., Haughton, D., Legrand, P., Skaletsky, M. & Woolford, S. 2011. Identifying groups: A comparison of methodologies. *Journal of Data Science,* 9**,** 271-291.

Field, A. 2013. *Discovering statistics using IBM SPSS statistics*, sage.

Grimsrud, M. & El-Geneidy, A. 2014. Transit to eternal youth: lifecycle and generational trends in Greater Montreal public transport mode share. *Transportation,* 41**,** 1-19.

Guthrie, A. & Fan, Y. 2016. Weakening Obstacles to Transit Use: Changes in Relationships with Child Rearing and Automobile Access from 2000 to 2010. *Transportation Research Record,* 2565**,** 103-110.

Haughton, D., Legrand, P. & Woolford, S. 2009. Review of three latent class cluster analysis packages: Latent Gold, poLCA, and MCLUST. *The American Statistician,* 63**,** 81-91.

Hjorthol, R. 2016. Decreasing popularity of the car? Changes in driving licence and access to a car among young adults over a 25-year period in Norway. *Journal of Transport Geography,* 51**,** 140-146.

Jones, H., Chatterjee, K. & Gray, S. 2014. A biographical approach to studying individual change and continuity in walking and cycling over the life course. *Journal of Transport & Health,* 1**,** 182-189.

Kaplan, D. 2004. *The Sage handbook of quantitative methodology for the social sciences*, Sage.

Klein, N. J., Guerra, E. & Smart, M. J. 2018. The Philadelphia story: Age, race, gender and changing travel trends. *Journal of Transport Geography,* 69**,** 19-25.

Klein, N. J. & Smart, M. J. 2017. Millennials and car ownership: Less money, fewer cars. *Transport Policy,* 53**,** 20-29.

Kuhnimhof, T., Buehler, R. & Dargay, J. 2011. A new generation: travel trends for young Germans and Britons. *Transportation Research Record,* 2230**,** 58-67.

Line, T., Chatterjee, K. & Lyons, G. 2010. The travel behaviour intentions of young people in the context of climate change. *Journal of Transport Geography,* 18**,** 238-246.

Luke, R. 2018. Car ownership perceptions and intentions amongst South African students. *Journal of Transport Geography,* 66**,** 135-143.

Magidson, J. & Vermunt, J. 2002. A Nontechnical Introduction to Latent Class Models. Statistical Innovations 1:15.

Mccarthy, L., Delbosc, A., Currie, G. & Molloy, A. 2018. Changes are afoot: Early signs of declining car orientation among families with children. *Transportation Research Board 97th Annual Meeting.* Washington DC.

Mcdonald, N. C. 2015. Are Millennials Really the "Go-Nowhere" Generation? *Journal of the American Planning Association,* 81**,** 90-103.

Molin, E., Mokhtarian, P. & Kroesen, M. 2016. Multimodal travel groups and attitudes: A latent class cluster analysis of Dutch travelers. *Transportation Research Part A: Policy and Practice,* 83**,** 14-29.

Newbold, K. B. & Scott, D. M. 2017. Driving over the life course: The automobility of Canada's Millennial, generation X, baby boomer and greatest generations. *Travel Behaviour and Society,* 6**,** 57-63.

Nylund, K. L., Asparouhov, T. & Muthén, B. O. 2007. Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural equation modeling,* 14**,** 535-569.

Oakil, A. T. M., Manting, D. & Nijland, H. 2016. Determinants of car ownership among young households in the Netherlands: The role of urbanisation and demographic and economic characteristics. *Journal of Transport Geography,* 51**,** 229-235.

Prillwitz, J., Harms, S. & Lanzendorf, M. 2007. Interactions Between Residential Relocations, Life Course Events, and Daily Commute Distances. *Transportation Research Record: Journal of the Transportation Research Board,* 2021**,** 64-69.

Ralph, K., Voulgaris, C. T., Taylor, B. D., Blumenberg, E. & Brown, A. E. 2016. Millennials, built form, and travel insights from a nationwide typology of U.S. neighborhoods. *Journal of Transport Geography,* 57**,** 218-226.

Ralph, K. M. 2016. Multimodal Millennials? The Four Traveler Types of Young People in the United States in 2009. *Journal of Planning Education and Research.*

Scheiner, J. 2018. Why is there a change in travel behaviour? In search of a theoretical framework for mobility biographies. *ERDKUNDE,* 72**,** 41-62.

Schoenduwe, R., Mueller, M. G., Peters, A. & Lanzendorf, M. 2015. Analysing mobility biographies with the life course calendar: a retrospective survey methodology for longitudinal data collection. *Journal of Transport Geography,* 42**,** 98-109.

Settersten Jr, R. A. & Ray, B. 2010. What's going on with young people today? The long and twisting path to adulthood. *The future of children,* 20**,** 19-41.

Sigurdardottir, S. B., Kaplan, S., Møller, M. & Teasdale, T. W. 2013. Understanding adolescents' intentions to commute by car or bicycle as adults. *Transportation research part D: transport and environment,* 24**,** 1-9.

Taylor, P., Parker, K., Kochhar, R., Fry, R., Funk, C., Patten, E. & Motel, S. 2012. Young, underemployed and optimistic: coming of age, slowly, in a tough economy. Pew Research Center.

Thigpen, C. & Handy, S. 2018. Driver's licensing delay: A retrospective case study of the impact of attitudes, parental and social influences, and intergenerational differences. *Transportation Research Part A: Policy and Practice,* 111**,** 24-40.

Vermunt, J. & Magidson, J. 2016. Technical guide for Latent GOLD 5.1: basic, advanced, and syntax. Statistical Innovations. *Inc., Belmont Google Scholar.*

Vermunt, J. K. & Magidson, J. 2005. *LATENT GOLD 4.0 User's Guide,* Belmont, Massachusetts: Statistical Innovations Inc.