

# Describing and characterising on-demand delivery of unhealthy commodities in New Zealand

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Calling your local pizza delivery company on a Friday night is quickly being replaced with a new generation of online ordering. We have observed a global expansion of on-demand delivery services, enabling effortless and rapid access to unhealthy commodities such as fast food, alcohol, cigarettes and vaping devices at our fingertips.<sup>1</sup> On-demand services are those where delivery is fulfilled rapidly, with commodities of a quantity and preparation intended for immediate consumption (e.g. pre-prepared meals, or a few bottles of wine). In this way, these technologies are distinct from 'traditional' food and alcohol delivery such as wine boxes or grocery delivery that can be ordered, but are not pre-prepared, and are delivered in a slower time frame. In some cases, orders are outsourced to a third-party company that is paid a delivery fee and may separately contract drivers. The surge of growth in the uptake of online food and alcohol delivery, which was exacerbated by the COVID-19 pandemic,<sup>2,3</sup> is expected to continue, with a predicted annual revenue growth rate for online food delivery in New Zealand (NZ) of 5.69% over the next 3 years (compound annual growth rate 2021–2024).<sup>4</sup> The changes in consumer behaviour and consumption driven by these services have the potential to impact the health of New Zealanders and exacerbate existing health inequities in our communities. Despite this, there is little research on how the landscape of unhealthy commodity availability is changing and the impacts of these services on consumption patterns and public health.

## Abstract

**Objective:** To determine the geographical location and characteristics of on-demand delivery services operating in New Zealand.

**Methods:** We systematically searched the web and application (app) stores for on-demand services offering rapid delivery of food, alcohol, cigarettes or vaping products in New Zealand and mapped their geographic location as of May 2021. Using desktop review, data on service characteristics were collected and stratified including: types of commodities available, promotion strategies, and the legal aspects of access to age-restricted items.

**Results:** On-demand services for food, alcohol and nicotine products operate across urban and rural New Zealand. All services offered personal memberships and 97% used promotions. All services offering restricted items had an age verification process, however, only 87% had birth date entry and 73% had an 18+ message pop-up on website entry. Only 60% of services appeared to have number limits on restricted items.

**Conclusions:** Much of New Zealand is serviced by on-demand delivery services.

**Implications for public health:** The trend towards on-demand delivery services may increase unhealthy food, alcohol and nicotine-related harms and it undermines current government actions, e.g. the Smokefree 2025 goal. This research informs policy to reduce the future health burden.

**Key words:** alcohol, unhealthy food, app-based, nicotine, vaping

Accessibility of fast-food services has been identified as one of the drivers of the obesity epidemic worldwide,<sup>5</sup> as well as a driver of health disparities related to socioeconomic status.<sup>6</sup> The digitalisation of the food industry has enabled restaurants to expand their geographical reach and therefore their accessibility to the population. Extensive evidence shows the inextricable link between diets high in salt, fat and sugar and non-communicable disease.<sup>7,8</sup> The same is true for alcohol<sup>9</sup> and nicotine products,<sup>10</sup> where these products can also have a synergistic carcinogenic effect.<sup>11</sup> The diverse and competing range of food delivery platforms means that users can order a variety of foods,

often including healthy options. However, a 2020 study of online food delivery in Sydney and Auckland found that 74% of the restaurants on Uber Eats, the largest third-party food delivery platform in New Zealand, were classified as unhealthy, as assessed by a Food Environment Score.<sup>12</sup> This study also revealed that the majority (88%) of the top five most popular food items ordered were classified as discretionary.<sup>12</sup> This suggests that on-demand delivery platforms may facilitate the consumption of unhealthy foods.

Alcohol, cigarette and vaping device vendors have also begun to utilise this emerging market, and this may result in increased (unlawful) access for underage/intoxicated

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persons. Early international studies have shown that compliance with alcohol regulations was already reduced in relation to alcohol delivery as compared to direct purchases from a vendor, and contactless delivery and alcohol delivery has been identified as a source of alcohol for underage consumers.<sup>13</sup> A 2012 study found that nearly half of alcohol orders placed by underage consumers were delivered.<sup>14</sup> This situation is likely to be exacerbated by on-demand alcohol delivery. It is also important to explore if on-demand services will magnify the binge-drinking culture in New Zealand,<sup>3</sup> where already approximately half of the alcohol sold in New Zealand is consumed during a heavy drinking occasion.<sup>15</sup> An Australian survey showed that nearly 70% of those ordering on-demand delivery for alcohol had already consumed more than five standard drinks in that day, and 28% of survey respondents reported that delivery enabled them to continue consuming alcohol when they would have had to otherwise stop.<sup>16</sup> Similar trends have already been identified in New Zealand in relation to online alcohol delivery (which included some on-demand services).<sup>3</sup>

Some demographic groups are more likely to use on-demand services than others. There is evidence to suggest that the majority of users of on-demand delivery are young people.<sup>12,16</sup> Health equity issues may also be reinforced by these services. Socioeconomically deprived areas, where Māori and Pasifika communities are over-represented, experience a double burden of lower income and a higher density of fast-food outlets,<sup>17,18</sup> which interact as determinants of harm.<sup>19</sup> These at-risk population groups may be disproportionately impacted by on-demand delivery services, particularly if unhealthy food offerings are targeted at these neighbourhoods.<sup>12,20,21</sup> Traditional policies are based on the 'built' food, alcohol and nicotine environment, where measures such as restricting the number of outlets in a location are employed to reduce consumption. On-demand delivery destabilises these policies by eliminating geographical barriers to access. It would logically follow that policies may need to be reconstructed to align with the new digitalised food environment.

Our research aimed to explore the geographical location and characteristics of on-demand food, alcohol and nicotine delivery services in New Zealand. Our scope focuses on third-party food delivery services and all services offering on-demand alcohol,

cigarettes and vapes, and aimed to describe the commodities available, promotion techniques and how the legal aspects around providing restricted items are being handled (noting that for alcohol, cigarettes and vaping products you must be aged 18 or over to legally purchase these commodities in New Zealand). Specifically, we aimed to answer:

i) how many services provide on-demand access to unhealthy commodities in New Zealand; ii) where these are located and iii) what the key characteristics of these services are. Completing these aims also enabled establishing a baseline for on-demand access and service provision in New Zealand for later assessment of change over time or the impacts of future policy changes. To the best of our knowledge, this research is the first to map the geographical availability of on-demand delivery services for unhealthy commodities collectively and the first to map these for an entire country. By seeking to inform policies and regulations surrounding these services, our research has the potential to influence the upstream determinants of health and reduce the health system burden from unhealthy commodities.

## Methods

We conducted a cross-sectional desktop review of the on-demand delivery services in New Zealand between 27 April and 21 May 2021. This approach was chosen to enable us to quantify the services available at a point in time, with a methodology that could be replicated to quantify change over time. We define 'on-demand' services as those able to deliver commodities within two hours of ordering, consistent with previous research by this team (currently in review). We define a 'restricted item' as a commodity that cannot be sold to minors and/or intoxicated persons as mandated by New Zealand law.

## Inclusions and exclusions

Services were excluded if they only offered pick-up for orders or were not operating at the time of this search. For services offering only food delivery, they were excluded if they were not third-party services, for example, if delivery was advertised but this was an operation of the restaurant itself rather than the ordering platform. However, all on-demand delivery services for alcohol, cigarette and vaping devices were included, whether or not they were third-party services. This allowed us to focus on the novelty aspect

of delivery services in that they have recently become a platform for age-restricted items. Restricting food delivery services to third-party only allowed for a manageable scope for this research. This meant that individual restaurants offering delivery via online ordering would not be included in the study.

## Search strategy

A four-stage search strategy was used to identify on-demand services:

### Stage 1 – Initial scoping of known services

We identified a small sample of well-known services to begin our searches: Uber Eats, Deliver Easy, Gimme, Bevee, Cheers Club, Drinks Mate, Menulog and On the Rocks Now.

### Stage 2 – Web-based search

We conducted a search on the Google search engine. We screened the top 100 results of each search. Services were included only if they met the inclusion criteria outlined above. The specific terms used and the number of results yielded are listed below:

- "Food Delivery Fast NZ" yielded five new services
- "Food Delivery App NZ" yielded two new services
- "Alcohol Delivery Fast NZ" yielded no new services.
- "Cigarette Delivery Fast NZ" yielded no new services.
- "Vape Delivery Fast NZ" yielded no new services.

### Stage 3 – App-based search

We searched for on-demand delivery phone applications (apps) on the Google Play Store and IOS Apple App Store. A search of the Google Play Store in the 'Food and Drink' category, using the keyword "delivery", yielded two new services. The top 100 food and drink applications were also screened, and this search identified one other new service. The IOS App Store was also searched and the top 100 food and drink applications were screened and there were no new services identified.

### Stage 4 – City-specific search

To check that we had not missed any services through generic nationwide searching, we conducted city-specific searches using the top 10 most populated cities in New Zealand according to the Statistics New Zealand

website.<sup>22</sup> The 10 largest cities by population are as follows: Auckland, Christchurch, Wellington, Hamilton, Tauranga, Dunedin, Lower Hutt, Whangarei, Palmerston North and Hastings. For each of these 10 cities, we conducted four searches, each relating to the type of commodity, with the following search terms: “city” food on demand delivery, “city” alcohol on demand delivery, “city” cigarette on demand delivery and “vape” on demand delivery. We screened the top 100 results yielded in the Google search engine. On some occasions, Google produced fewer than 100 results, in which case, all of the results shown were screened. Overall, four new services were identified: one each specific to Queenstown, Auckland, Christchurch and Hamilton.

### Unit of analysis

A service unit (N) was considered a [location + service]. This was because the services offered by a company often differed by location, therefore to characterise the services, we had to consider each [location + service] as a single unit. For example, if a single company serviced four towns or cities in New Zealand, this would be considered four service units. We calculated the number of units for each combination of services and the percentage of each type of service.

We standardised locations according to Statistics New Zealand’s ‘Functional Urban Areas’ (FUA) classification.<sup>23</sup> However, given the surprising extent of services outside of the main urban areas, we classified smaller urban and rural areas according to Statistics New Zealand’s urban and rural categories areas.<sup>24</sup> Given discrepancies between providers in their location descriptions, we aggregated or disaggregated to FUA or small towns or rural areas.

### Data extraction

To organise our data, we constructed a pilot table based on the supplemental tables in Williams and Schmidt (2014) and Colbert et al. (2020).<sup>25,26</sup> Using our pilot table we initially sampled four services to trial the data collection method.

Data were collected from the services’ web pages, and if available, phone apps. Websites were accessed using incognito tabs to prevent search history from influencing subsequent results and to stop location data influencing the search. If possible, we gathered information as a ‘guest’, however,

some companies required that we create an account with them in order to obtain the necessary information. When creating an account, location or address details were not required to be entered, however, some services required the addition of a birth date upon account creation and this was added as a birth date over the age of 18. Data were extracted from the websites, where much of the information was found in the ‘FAQ’, ‘Terms and Conditions’ and ‘About Us’ sections.

For each [location + service] unit, data were collected on the commodities available and times of availability, delivery costs, and promotion strategies. Where possible, websites and apps were browsed without adding location or address data to minimise bias, however, some services required an address to be entered before items could be added to the shopping cart. In these instances, for each area listed as a delivery location on the website, we selected a random address through Google Maps by dropping a pin at a central point of the service area, and entering this into the on-demand website or app to access data. Items were added to the cart and taken to the checkout stage to provide information on payment methods (including whether ‘buy now, pay later’ schemes could be used), product number limits, and further barriers to purchasing restricted items. The rationale for taking items through to the ‘cart’ stage was to ensure that no final pop-ups or warnings would appear if restricted items were about to be purchased. No payment information was entered and no items were purchased. All data was recorded onto a master table which was an extended and refined version of the original pilot table. The full data collection table is provided as Supplementary File 1.

To determine the geographic availability of services across New Zealand we recorded the number of services offering each commodity at that location. To assess the types of commodities available in New Zealand, we stratified the data into categories depending on the combination of commodities they offered. The categories were: Food Only; Alcohol Only; Vape Only; Food and Alcohol; Alcohol and Cigarette; Alcohol and Cigarette and Vape. There were no other combinations of commodities (e.g. Alcohol and Vape), so these were not included in the results.

The characteristics of services that offer specific commodities were extracted. Characteristics explored were promotions and the handling of legal issues related to

the provision of restricted items. A promotion was defined as a marketing action taken by the company to encourage consumers to purchase by attempting to provide added value to consumers (such as offering free gifts with purchases, discounts with multiple purchases, free delivery, discount codes and loyalty points). Referral rewards are when the customer receives a benefit such as a discount by enrolling another consumer as a member of the service. Given the novel access to restricted items being available via online delivery platforms, we extracted data relevant to the associated legal restrictions. Therefore, we included further details on how services conducted age verification, including ID checks and 18+ pop-ups (whereby a window opens that either requires a person to enter their birth date or verify their age or asks them to confirm that they are aged 18 or over). We also recorded whether the delivery companies held a liquor licence and whether the drivers were employed by the service or acting as independent contractors. A full description of the characteristics criteria used is provided in the Supplementary File.

Websites and apps were accessed separately by two independent researchers. To ensure results were comparable, we performed a reliability test of the 10 largest services. On a separate document, the 10 services were searched again, and all data fields were extracted by the researcher who did not do the initial search on that service. The original results table and this separate document were cross-checked by both researchers together; any discordant results were checked for a third time together and the correct value was agreed upon by both researchers and changed appropriately in the results table. Inconsistencies were discussed before progressing with further extraction. Our reliability testing was reassuring with an acceptable level of concordance. Of 87 items that were checked, only four items were different, and these were updated by reaching consensus between the researchers, indicating a high level of inter-rater reliability.

### Data analysis

Given the aims were focused on descriptive analysis and establishing a baseline for on-demand access to unhealthy commodities in New Zealand at a specific point in time, no statistical analysis was performed beyond the calculation of percentages. All criteria were presented as a binary ‘Yes/No’ coded outcome and there were no missing data points. Where

a criterion specifically related to a restricted item, it is presented as N/A (not applicable) for services not providing these commodities.

## Results

### Number of services in New Zealand

Our search revealed 130 services [service + location units] offering on-demand delivery of unhealthy commodities in New Zealand, shown in Table 1. As noted in the methods, this excludes individual restaurants that directly provide a delivery service (i.e. not coordinated through a third-party app or service). Overall, 76% of on-demand delivery services supply food, 37% of the services supply alcohol, 21% supply cigarettes and 22% supply vapes. The most common type of on-demand delivery service is food-only (60%), followed by alcohol-only (18%) and food and alcohol (16%).

### Location of services in New Zealand

The location of services within New Zealand are shown in Figure 1. The locations with the highest total number of services are as follows: Auckland (12), Christchurch (8), Wellington (8), Dunedin (7), Hamilton (6), Tauranga (6) and Nelson (6), all of which are in listed in the top 10 most populated cities in New Zealand. This shows that there is a higher number of services in the most populated cities of New Zealand, but the reach of these services also extends to rural

areas. Some FUA were not serviced by any on-demand delivery company. The FUAs that are not currently serviced are (in alphabetical order): Alexandra, Cromwell, Dannevirke, Gore, Greymouth, Hawera, Huntly, Kaitaia, Katikati, Kawerau, Marton, Morrinsville, Motueka, Otaki, Stratford, Thames, Warkworth and Whakatane. These locations are evenly distributed throughout the North and South Islands.

### Characteristics of services in New Zealand

The characteristics of the services [unit = service + location] are shown in Table 2, differentiated by the type of commodity being offered, as well as a summary of all commodities. A full description of all data extracted is provided as Supplementary File 1, which was accurate within the search dates (27 April until 21 May 2021). A total of 91% of the total services had provision for ordering via phone apps. Promotions are used as a marketing strategy by 97% of services (95% of food-only services and 100% of the other services). All services had the option of a personal membership, 63% of which required signing up for purchase (no guest checkout). Referral rewards (30%) were the most common among vape-only delivery services (100%) and food and alcohol delivery services (95%). 52% of services had a minimum spend requirement, including 79% of food-only services, 100% of alcohol and cigarette, and

100% of alcohol and cigarette and vape services. For alcohol-only and vape-only services, this was 4% and 0%, respectively. No services offered 'buy now, pay later' options.

Of the services providing delivery of restricted items, all had a stated age verification process. However, only 87% had birth date entry and 73% had an 18+ pop-up on entry to the website. All of the alcohol-only services had the birth date entry and 18+ pop-up. The 18+ pop-up dropped to 57% for food and alcohol services, and 50% for alcohol and cigarette services. The vape-only services did not have either of these barriers. No services offered contactless delivery of restricted items, aside from the vape-only service. Only 60% of services for delivery of restricted items appeared to have product number limits. There did not appear to be number limits for vape-only, alcohol and cigarette, and alcohol and cigarette and vape services. Information on the employment status of delivery drivers was not uniformly available. We were only able to find information on this for 12 of the delivery companies, 11 of which stated that drivers were self-employed and acting as independent contractors.

## Discussion

This study aimed to establish a baseline for on-demand access and service provision in New Zealand by describing the number of services operating in New Zealand at a point in time and the location of these services, and by providing overview characteristics of these services. Our study shows that on-demand delivery services are accessible across New Zealand and these are likely to continue to expand. The high number of services and the number of locations being serviced was unexpected and surprising. As expected, these delivery services are operating more extensively in the more populated areas, including those services that provide age-restricted items such as alcohol and cigarettes. However, there are services in small towns such as Tokoroa (population 14,300) and Levin (population 18,800), suggesting that rurality is not necessarily a protective factor for the availability of unhealthy commodities, and future studies should consider health equity and rural health considerations in relation to these services. The substantial number and spread of the services we have observed are predicted to continue,<sup>4</sup> and we found media items indicating that online delivery services

**Table 1: Commodities available via on-demand delivery services in New Zealand. Services are classified by the type commodities they provide (e.g. food-only), and a unit (N) is a service type at a location [service + location].**

Type of Service	N	% of total
Food Only	78	60%
Alcohol Only	23	18%
Cigarette Only	0	0%
Vape Only	4	3%
Food + Alcohol	21	16%
Food + Cigarette	0	0%
Food + Vape	0	0%
Food + Alcohol + Cigarette	0	0%
Food + Alcohol + Vape	0	0%
Food + Alcohol + Cigarette + Vape	0	0%
Food + Cigarette + Vape	0	0%
Alcohol + Cigarette	2	2%
Alcohol + Vape	0	0%
Alcohol + Cigarette + Vape	2	2%
<b>Total services</b>	<b>130</b>	
Any food combination	99	76%
Any alcohol combination	48	37%
Any cigarette combination	27	21%
Any vape combination	29	22%

*Note: combinations (final four rows) add to more than 100% as some services sell more than one type of commodity.*



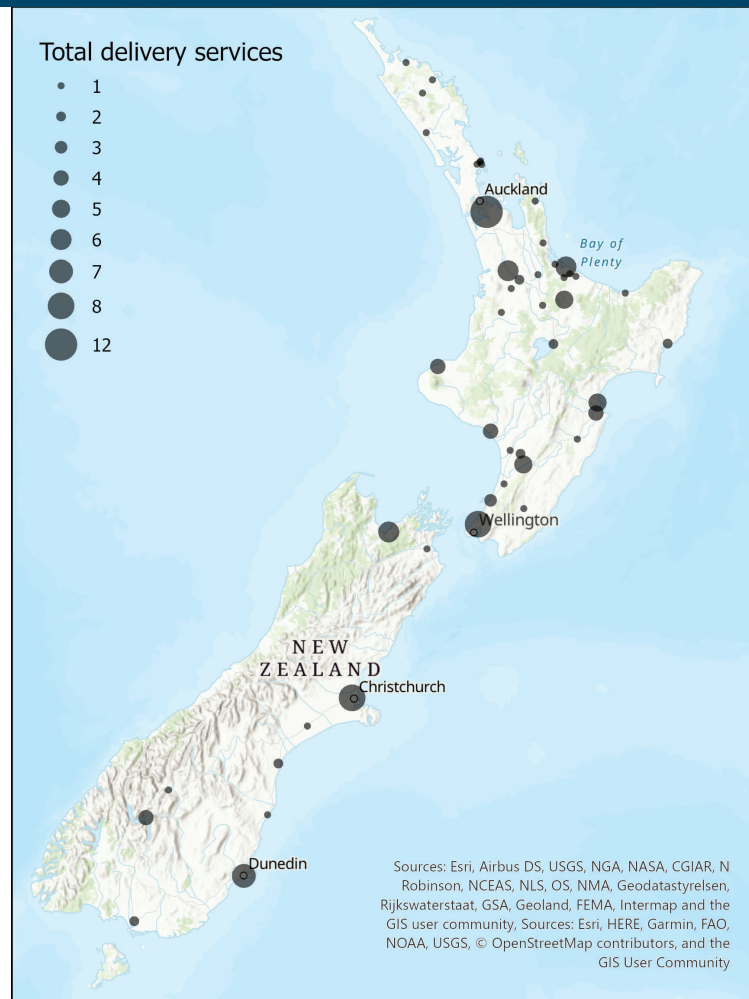
intend to both increase their product range to include restricted items<sup>27</sup> and expand the locations that they service in New Zealand.<sup>28,29</sup>

Our study revealed that all services implemented promotion strategies designed to increase consumption,<sup>30</sup> with the widespread use of tools such as price promotions, memberships and referral rewards. These promotion strategies occur within the wider context of an increase in digital marketing strategies overall for unhealthy commodities, especially food.<sup>31</sup> For example, 85% of marketing for food products on Facebook and YouTube in New Zealand is for unhealthy food products that are not permitted to be marketed to children.<sup>32</sup> Unhealthy food marketing for on-demand food delivery services also contributes to a food environment in New Zealand that is largely unhealthy.<sup>32</sup> The international rise of digital marketing creates challenges in monitoring its impacts,<sup>33</sup> however, the links between digital marketing and app-based delivery were beyond the scope of this research and need to be further explored.

It is possible that alcohol and vape delivery companies may have some positive public health impacts; these could include fewer instances of driving while intoxicated and lower rates of cigarette smoking, respectively. However, the public health benefits are not yet established in the literature. Although a previous study in Australia has shown that not wanting to drive while intoxicated is a reason for using on-demand services,<sup>16</sup> there is also evidence that needing to drive is a reason for choosing not to drink or drinking less;<sup>34</sup> the harms associated with both driving while intoxicated and increased individual consumption need to be considered collectively. Furthermore, although the harm-reduction potential of e-cigarettes is recognised, there are also concerns around health protection, from the – as yet – unclear impacts of increased e-cigarette use,<sup>35</sup> particularly given the relative ease of access for young people<sup>36</sup> and emerging evidence of increasing uptake of e-cigarette use those who have never smoked cigarettes.<sup>37</sup> In conclusion, the net public health benefits or costs of on-demand access requires more careful scrutiny. Future research evaluating the positive and negative public health impacts of these services would be of substantial benefit.

We identified interesting patterns surrounding the licensing of restricted items,

Figure 1: Geographical location of on-demand delivery services in New Zealand.



which are important to consider from a policy and regulation perspective as on-demand services grow in popularity. The current *Sale and Supply of Alcohol Act 2012* specifies that for remote sales, alcohol delivery must not occur between 11 pm and 6 am, the liquor licence must be displayed on the website and the vendor must take reasonable steps for age verification (examples are a 'tick box' on entry to the site and at check out). All services appeared to comply with these delivery hours. We found a distinction in licensing between services offering delivery as a third-party service and those holding their own liquor licence; the latter often selling from warehouse premises. Third-party delivery services of restricted items displayed the liquor licences of the primary vendors on their websites, rather than holding their own liquor licence. Other services, that are not third-party delivery companies, display their own liquor licences. However, despite offering delivery services to many areas in New Zealand, the liquor licence was only

issued for the area where the company is registered. This potentially presents additional problems in areas of New Zealand that currently operate under liquor licensing trusts. In some areas, only the licensing trusts may be granted liquor licences to sell alcohol from approved premises. For example, in Invercargill, the community controlled licensing trust (ILT) has banned the sales of alcohol in supermarkets and has imposed other alcohol restrictions. However, from our study, it is clear that on-demand services are delivering within the trust control areas, under licences given by licensing committees in other parts of the country. While this is similar to how wineries, beer breweries and supermarkets have been operating alcohol delivery for decades under the *Sale and Supply of Alcohol Act 2012*, the on-demand nature of delivery presents new challenges and potentially alcohol-related harms for district councils that have historically regulated real-time sales of alcohol within their geographical remit.

Table 2: Characteristics of the On-Demand Delivery Services available in New Zealand.				
Service type	Characteristics	n services	% of total by type of service	
All services	Total	130		
	Promotions	126	97%	
	Membership Personal	130	100%	
	Membership Business	14	11%	
	Referral Rewards	39	30%	
	Newsletter Sign Up	45	35%	
	Guest Checkout Available	48	37%	
	Phone Application	118	91%	
All services with restricted items (alcohol, cigarette, vapes)	Total	52		
	Restricted Item Specific	18+ Pop Up	38	73%
		Birth Date Entry	45	87%
		Stated Age Verification Process	52	100%
		Number Limits	31	60%
		Mention of >18 Law	52	100%
		Contactless Delivery	4	8%
All with Alcohol	Total	48		
	Liquor Licence	16	33%	
	Mention of Intoxication Law	48	100%	
Food Only	Total	78		
	Promotions	74	95%	
	Membership Personal	78	100%	
	Membership Business	4	5%	
	Referral Rewards	15	19%	
	Newsletter Sign Up	6	8%	
	Guest Checkout Available	33	42%	
	Phone Application	71	91%	
Alcohol Only	Total	23		
	Promotions	23	100%	
	Membership Personal	23	100%	
	Membership Business	1	4%	
	Referral Rewards	0	0%	
	Newsletter Sign Up	23	29%	
	Guest Checkout Available	0	0%	
	Phone Application	23	100%	
	Minimum Spend	1	4%	
	Restricted Item Specific	18+ Pop Up	23	100%
		Birth Date Entry	23	100%
		Stated Age Verification Process	23	100%
		Number Limits	22	96%
		Liquor Licence	1	4%
		Mention of >18 Law	23	100%
		Mention of Intoxication Law	23	100%
	Contactless Delivery	0	0%	
Vape Only	Total	4		
	Promotions	4	100%	
	Membership Personal	4	100%	
	Membership Business	0	0%	
	Referral Rewards	4	100%	
	Newsletter Sign Up	4	100%	
	Guest Checkout Available	4	100%	
	Phone Application	0	0%	
	Minimum Spend	0	0%	
	Restricted Item Specific	18+ Pop Up	0	0%
		Birth Date Entry	0	0%
		Stated Age Verification Process	4	0%
		Number Limits	0	0%
		Liquor Licence	N/A	N/A
		Mention of >18 Law	4	100%
Mention of Intoxication Law		N/A	N/A	
Contactless Delivery	4	100%		

The differences in liquor licensing are a point of interest as it raises concerns around legal liability for the delivery of restricted items to underage and/or intoxicated persons. Licensees are responsible for unlawful delivery of restricted items, suggesting there could be a greater rate of unlawful deliveries among third-party deliverers where the courier company holds no legal liability. As they are not direct vendors of alcohol, they may also not be subject to the same regulations as an internet alcohol supplier described above. Internationally, this issue has recently been addressed in New South Wales, Australia (the '24-hour economy' reforms), through a series of actions addressed at on-demand delivery, including for deliverers to be trained in responsible delivery of alcohol, and broadening compliance activities to include on-demand alcohol providers and their employees and agents.<sup>38</sup> Most of the New Zealand websites offering restricted products had stated a method of age verification in their terms and conditions, and no alcohol or cigarette delivery services offered contactless delivery. Contactless delivery has been indicated as one of the factors that increase the likelihood of underage persons obtaining alcohol unlawfully,<sup>13</sup> which could extend to other restricted products, so while it is positive to see this not being offered in New Zealand at this time, this situation should be monitored. By contrast, an Australian study by Colbert et al. reported that 75% of retailers advertised a willingness to leave alcohol unattended at an address.<sup>25</sup> No services currently offered 'buy now, pay later' (e.g. 'Afterpay') schemes, which is a positive finding. These schemes are considered especially problematic as they are crucial modifiers in alcohol purchasing behaviour, particularly for vulnerable groups, including those with alcohol dependency and underage drinkers;<sup>39</sup> this is of particular concern if card-holder details do not need to be entered. These payment methods are common overseas, for example, in Australia, 13.8% of providers of online alcohol delivery offered 'buy now, pay later' options.<sup>25</sup> Without regulations around this in New Zealand, we may follow the trend. All services also stated in their terms and conditions that alcohol would not be delivered to underage or intoxicated persons. All alcohol delivery services also stated that should the consumer be found to be underage or intoxicated, the delivery would not be fulfilled. In this instance, nine out of 10 of these services

**Table 2 cont.: Characteristics of the On-Demand Delivery Services available in New Zealand.**

Service type	Characteristics	n services	% of total by type of service	
Food + Alcohol	Total	21		
	Promotions	21	100%	
	Membership Personal	21	100%	
	Membership Business	9	43%	
	Referral Rewards	20	95%	
	Newsletter Sign Up	9	43%	
	Guest Checkout Available	9	43%	
	Phone Application	21	100%	
	Minimum Spend	1	5%	
	Restricted Item Specific	18+ Pop Up	12	57%
		Birth Date Entry	20	95%
		Stated Age Verification Process	21	100%
		Number Limits	9	43%
		Liquor Licence	11	52%
Mention of >18 Law		21	100%	
Mention of Intoxication Law		21	100%	
Contactless Delivery	0	0%		
Alcohol + Cigarette	Total	2		
	Promotions	2	100%	
	Membership Personal	2	100%	
	Membership Business	0	0%	
	Referral Rewards	0	0%	
	Newsletter Sign Up	1	50%	
	Guest Checkout Available	2	100%	
	Phone Application	1	50%	
	Minimum Spend	2	100%	
	Restricted Item Specific	18+ Pop Up	1	50%
		Birth Date Entry	2	100%
		Stated Age Verification Process	2	100%
		Number Limits	0	0%
		Liquor Licence	2	100%
Mention of >18 Law		2	100%	
Mention of Intoxication Law		2	100%	
Contactless Delivery	0	0%		
Alcohol + Cigarette + Vape	Total	2		
	Promotions	2	100%	
	Membership Personal	2	100%	
	Membership Business	0	0%	
	Referral Rewards	0	0%	
	Newsletter Sign Up	2	100%	
	Guest Checkout Available	0	0%	
	Phone Application	2	100%	
	Minimum Spend	2	100%	
	Restricted Item Specific	18+ Pop Up	2	100%
		Birth Date Entry	0	0%
		Stated Age Verification Process	2	100%
		Number Limits	0	0%
		Liquor Licence	2	100%
Mention of >18 Law		2	100%	
Mention of Intoxication Law		2	100%	
Contactless Delivery	0	0%		

*Note:*  
This only includes headings for combinations of services currently available in New Zealand.

would offer a refund of the alcohol (not including the delivery fee and/or a restocking fee). One delivery service stated that the consumer would forfeit the full price of the alcohol product(s). Despite the fact that all alcohol delivery services stated their legal requirement to restrict alcohol deliveries to those over 18, some websites/apps did not have barriers such as 18+ pop-ups and birth date entry on checkout, suggesting that there is a lack of standardisation for the online sale of restricted items. Importantly there is also international evidence suggesting that compliance with regulations is low. An Australian survey found that more than one-third of respondents under the age of 25 reported either receiving alcohol delivery without an ID check or while they were not present.<sup>16</sup> This is despite the RDA (Retail Drinks Australia) code outlining that any person accepting alcohol who looks under 25 is required to provide sufficient age identification.<sup>40</sup> Collectively, this evidence suggests it will be important for future studies to assess compliance by on-demand online delivery services to these legal regulations in New Zealand to determine if these services facilitate alcohol access for underage/intoxicated persons.

**Limitations and strengths**

To the best of our knowledge, this study is the first to map the geographical spread and types of on-demand delivery services that provide access to unhealthy commodities across New Zealand. We believe that this is also the first study to assess all unhealthy commodities via on-demand access at a nationwide level, providing a potential methodology for other jurisdictions. By describing the characteristics of these services including promotion strategies and how legal aspects related to providing restricted items are navigated, localised guidance is provided for policy makers, regulators and health promoters. By providing a description of the types of unhealthy commodities available via on-demand delivery in different locations of New Zealand, this study can provide a starting point for further research on the impacts of these services. Future research should focus on how these services have changed food, alcohol, cigarette and vaping consumption patterns in New Zealand. By extension, these changes in consumption patterns could be used to establish their contribution to non-communicable disease and alcohol-related harms.

Despite reaching a point of saturation in our search strategy, it is possible that we have not captured all of the delivery services, and others may exist in specific rural locations. This market is ever-changing and fast-adapting, and we expect that this landscape will continue to evolve, thus we have documented a snapshot of the services available during this study period. One limitation of our approach is that some delivery services do not provide deliveries to all suburbs within a stated location, so access is not universal across that location. In order to maintain a manageable scope, it would not have been feasible to construct our geographical analysis based on sampling all individual addresses within a given area. Our search strategy was designed to minimise bias, but in some instances, a location or address had to be added, or an account had to be created that included a birth date. This information may then have influenced the results, including any 'age-gating' protocols. These issues could be resolved in future studies through sampling multiple addresses to more accurately categorise geographic availability and by determining if differing account information alters any characteristics. Furthermore, our inclusion criteria excluded food delivery by individual restaurants that the restaurant directly operated via online ordering, whereas, given the relative novelty of alcohol and nicotine products being available through on-demand delivery, this criterion was not applied to those products. The impact of this decision is that we may have underestimated the number of services providing on-demand access to food. While acknowledging that the established criteria differentiate between food and alcohol/nicotine products, the impact has been likely minimal in that the alcohol and nicotine product delivery services that we identified were all through third-party providers and no individual stores providing on-demand delivery to alcohol or nicotine products were found.

We attempted to investigate the employment status of the drivers for the company, however, data on this were limited. Due to being self-employed contractors, many delivery drivers are not entitled to minimum wage, annual leave, sick pay, holiday pay, with many overseas missing out on benefits after job losses during the COVID-19 pandemic.<sup>41</sup> There have also been concerns in Australia around the safety of drivers, where a

November 2020 news article reported that four delivery drivers were killed in road traffic accidents in the previous three months, with 73% of drivers reporting that they were worried about being "seriously hurt or killed" at work.<sup>42</sup> A 2020 literature review identified that delivery drivers experience poor job satisfaction,<sup>43</sup> which is a predictor of poor physical and mental health.<sup>44</sup> This suggests that New Zealand may encounter the same issues around putting delivery drivers at a higher risk of poor physical and mental health, which should be included in future New Zealand-specific research.

### Implications for public health

This study addresses the urgent need to assess the changing landscape of access to unhealthy commodities. This can be used to inform public health policy in New Zealand, including national legislation and local planning. Although this is a specific case study of the services available in New Zealand, there is currently a global trend for a shift in consumer activity towards online and on-demand delivery services. With a lack of global policy, all jurisdictions will need to consider regulations around the supply of restricted commodities via on-demand online services. Other countries where health inequities are prominent may also be particularly interested in this methodology to inform their policies and legislation. To further inform public health outcomes, it will be important for future studies to investigate how these platforms affect different groups of the population by age, ethnicity, socioeconomic status/deprivation, culture, gender, education status and discretionary income. This information is essential in understanding the impact of on-demand delivery services on existing health inequities in New Zealand. In particular, youth and New Zealand Māori may be especially impacted by increased access to harmful commodities.

In New Zealand and internationally, some local policies restrict geographical locations, densities and trading hours of vendors providing unhealthy commodities.<sup>45</sup> These local policies are used as a regulatory lever to target determinants of health by creating barriers to accessing such commodities. However, on-demand delivery services threaten to undermine these policies. The New Zealand government has recently

proposed a substantial reduction in the number of retailers selling cigarettes in 2021, to align with their action plan for Smokefree 2025.<sup>46</sup> This was intended to reduce access to cigarettes, and by extension, improve public health and reduce health inequities. On-demand delivery services offering easy and rapid access to cigarettes directly contradicts this plan and render the nation's Smokefree 2025 goal less attainable.

### Conclusions

There is a large number of on-demand delivery services in New Zealand facilitating instant access to harmful commodities such as fast food, alcohol, cigarettes and vaping devices. These services are predominantly operating in the most populated areas but have expanded to service many rural areas as well. Most are employing powerful promotional techniques geared towards increasing consumption, such as promotions, memberships and referral rewards. Although all delivery services for restricted items have stated an age verification process in their terms and conditions, international studies suggest online on-demand delivery increases unlawful access to restricted items by underage/intoxicated persons. At present, there is no standardised regulation for these platforms in New Zealand. Without the appropriate regulatory oversight, these services have the potential to increase nutritional, alcohol and nicotine-related harms, and to counteract both local and nationwide actions that are being undertaken to reduce these harms, including the Smokefree 2025 goal. This research, the first of this kind, will establish a strong foundation for future studies on the impacts of on-demand delivery on both a national and global scale. Given the novelty of these services and the fact that they are expanding at an alarming rate, there is an urgent need for policy reform.

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## Supporting Information

Additional supporting information may be found in the online version of this article:

**Supplementary File 1:** Data description and full data extraction table.