

Community Knowledge and Awareness of Stroke in New Zealand

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Introduction: Community knowledge and stroke awareness is crucial for primary prevention of stroke and timely access to stroke treatments including acute reperfusion therapies. We conducted a national telephone survey to quantify the level of community stroke awareness. *Methods:* A random sample of 400 adults in New Zealand (NZ), stratified by the 4 main ethnic groups, was surveyed. Eligible participants answered stroke awareness questions using both unprompted (open-ended) and prompted questions (using a list). Proportional odds logistic regression models were used to identify factors associated with stroke awareness. *Results:* Only 1.5% of participants named stroke as a major cause of death. The stroke signs and symptoms most frequently identified from a list were sudden speech difficulty (94%) and sudden 1-sided weakness (92%). Without prompting, 78% of participants correctly identified at least 1 risk factor, 62% identified at least 2, and 35% identified 3 or more. When prompted with the list, scores increased 10-fold compared with unprompted responses. Ethnic disparities were observed, with Pacific peoples having the lowest level of awareness among the 4 ethnic groups. Higher education level, higher income, and personal experience of stroke were predictive of greater awareness ($P \leq .05$). *Conclusions:* Stroke was not recognized as a major cause of death. Although identification of stroke risk factors was high with prompting, awareness was low without prompting, particularly among those with lower education and income. Nationwide, culturally tailored public awareness campaigns are necessary to improve knowledge of stroke risk factors, recognition of stroke in the community and appropriate actions to take in cases of suspected stroke. **Key Words:** Stroke awareness—stroke signs—stroke risk factors—community—survey

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Introduction

Primary prevention and acute care of stroke requires community awareness of the risk factors and their management. Effective community-based educational and preventive programmes are predicated on accurate assessment of the knowledge of stroke and its risk factors within these communities.^{1,2} For these measures to be effective and to guide targeted strategies to maximize prevention and treatment, it is important to know if differences exist in stroke knowledge between different socio-demographic groups. Stroke awareness in the community is important given the recent advances in stroke reperfusion therapies,² and evidence on primary stroke prevention based on lifestyle and behaviour.³

Previous studies have shown that stroke awareness in the community setting is relatively low. An integrated review of the literature in 2009 found that knowledge of stroke prevention and symptoms of stroke were poor even amongst those who had experienced a stroke.⁴ Variable results have been reported across a range of countries and regions (Europe, North America, United Kingdom, Asia, and Australia). For example, the proportion of participants correctly identifying a risk factor ranged from as low as 18% up to a high of 94%, while only 25%-72% were able to name 1 symptom when asked open-ended questions. The observed variation is likely due to differences in correct responses between prompted and open-ended questions, as a greater proportion (95%-100%) correctly identified symptoms and risk factors when asked closed (prompted) questions.⁴ More recently, a convenience sample survey in an urban population found that 43% of respondents associated stroke with the brain and blood, and 42% were unable to identify any of the 4 F.A.S.T. campaign components (Face, Arm, Speech, and Time).⁵ Ethnic differences in risk factor identification were also reported: compared to New Zealand Europeans, Pacific Island respondents were less likely to identify a number of stroke risk factors, while Māori, Pacific Island, and Asians were less likely to identify stroke symptoms. A 2015 literature review looking at stroke knowledge in Spanish-speaking populations in America, Latin America, and Spain also identified that stroke knowledge,⁶ language, and socio-economic status (SES) were potential barriers to stroke awareness in these populations.

A broad community-based prevention approach requires an understanding of potential differences in terms of impact of stroke across different ethnic groups and SES. In NZ, Māori, and Pacific, peoples have a higher stroke incidence and experience strokes earlier in life than NZ Europeans,⁷ as well as greater socioeconomic disadvantage.⁸ Individuals of Māori, Pacific, and Asian ethnicity and those with lower SES also have a higher prevalence of stroke risk factors such as smoking, high blood pressure, and diabetes, and lower levels of access to healthcare.⁹ Given the suggested barriers, it is important

to specifically evaluate the level of stroke awareness by relevant demographic groups within a country to inform targeted public awareness campaigns. No previous awareness survey has been conducted in NZ at a national level which has attempted to include a stratified sample of all major ethnic groups. This is also of international relevance, given that similar ethnic disparities have been observed elsewhere.^{10,11} Hence, our aim was to quantify the level of stroke awareness in terms of identification of stroke symptoms, risk factors, appropriate actions to take, personal experience of stroke, and where stroke information was or could be obtained in the ethnically diverse NZ community.

Materials and Methods

Study Setting

A nationwide random sample of 400 adults aged 20 years and older was identified through landline telephone directories and the electoral roll across NZ. There was no national stroke awareness campaign at the time of or just prior to the survey. In 2014, a relatively small pilot campaign (including TV and public posters) was conducted in the Waikato region, which represents a small proportion (10%) of the NZ population. The sample was stratified by ethnicity for an intended equal representation of the 4 main ethnic groups in NZ; Māori, Pacific, Asian/other, and Europeans. The survey was conducted between April and June 2015. The study was approved by the Auckland University of Technology Ethics Committee (Reference #15/72).

Telephone Interviews

A random sample was initially selected from landline telephone directory listings. While utilizing mobile numbers was desirable, the increased expense in conducting the survey in this way prohibited this method of contact. Potential participants were screened for eligibility and asked for verbal consent to participate in the survey. Participants were eligible if they answered the phone, and were adults aged 20 years or older, currently living in the household, and agreed to participate in the survey. The survey used computer-assisted phone interviewing (CATI), a method validated for cardiovascular risk factor assessment in ethnically diverse populations.^{12,13} Up to 8 calls were made to every household in order to gain contact with a resident. An eligible person who lived in the household was randomly selected from each responding household. This random selection included people who met the criteria but were not at home at the time of first contact. Call backs to these individuals were made on a number of occasions so they could be interviewed. Each surveyed interviewee was asked to identify their ethnic group(s), to enable poststratification. For the purposes of

analyses, ethnicity was prioritized as per the NZ Ministry of Health protocols to assign a single ethnicity to an individual.¹⁴ Appropriate weighting was used to take account of ethnicity, the number of adults in the household, and the respondent's age group, and sex, in order to reflect the composition of the population. The weighting enabled the survey to represent the full population appropriately, without the biases that oversampling would introduce. An "ethnic booster" sampling strategy was also undertaken to ensure equal numbers within each ethnic group. This was done by accessing the Māori Electoral Roll to cover a wider cross-section of Māori than would otherwise be available. Asian and Pacific boosters were obtained by identifying Asian and Pacific surnames in the telephone directory.

Participants who agreed to complete the survey were asked to answer a series of questions on stroke knowledge and awareness using CATI. The survey questions were developed from a previously piloted telephone survey which tested the acceptability and comprehension of the questionnaire.¹⁵ Both unprompted and prompted methods of questioning were utilized. Unprompted questions were asked first followed by their related prompted questions to avoid influencing unprompted responses. (see Online Supplemental Table 1 for the main survey questions). While more detailed questioning was desirable, there was also an attempt to minimize participant burden by limiting the length of the questionnaire. For prompted questions, a list of possible responses was read out and participants were asked to respond with a yes, no, or do not know reply, as appropriate. They were then asked to identify factors they associate with increased risk of having a stroke, personal experience and family history of stroke, actions to take if someone has a stroke, what sources of information they have had or could access about strokes, personal health checks, and what lifestyle changes they may have tried or made to prevent having a stroke. The question to identify stroke risk factors was first asked as an unprompted question, followed later in the survey as a prompted question after further questions not relating to risk factors had been asked. The top 5 risk factors for stroke were regarded as high blood pressure, high cholesterol, low levels of physical activity or exercise, poor or unhealthy diet, and smoking.¹⁶ Three of the awareness related questions were unprompted, with open-ended responses. For example, participants were asked "If you or someone you know has any signs or symptoms of a stroke, what should you do?" Responses to open-ended questions were grouped into 5-6 broad categories according to major themes for analyses. A range of demographic variables including age, sex, ethnicity, income bracket, and education levels were also collected. Education was categorized as: (1) up to and including high school, (2) attending or attended university/vocational qualification, and (3) bachelors/higher degree. Income was categorized as: (1) low income (up to NZD

\$70,000 to USD \$50,000); (2) mid income (NZD \$70,001-NZD \$140,000 to USD \$50,001-USD \$95,000); (3) high income (over NZD \$140,001 to USD \$95,000). Ethnicity was categorized as: (1) NZ European, (2) Māori, (3) Pacific, and (4) Asian/Other.

Statistical Analysis

Descriptive statistics, reporting on frequencies, number of participants, and percentages are reported for demographic characteristics of the sample, and presented in bar plots for the number of correctly identified stroke risk factors. Chi-square and Fisher's exact tests and proportion testing were used to compare counts of correct responses between the 4 major ethnic groups. Proportional odds logistic regression models were used to investigate the association between the numbers of correctly identified stroke symptoms and risk factors by ethnicity, education, and income. Missing data was classified as not missing at random. The number of missing observations has been identified in the descriptive tables. Statistical significance was considered when $P < .05$.

Results

A total of 400 respondents completed the survey (Table 1). From 4074 sets of contact details received, 1990 were unable to be contacted, 484 declined to participate, and 1200 did not qualify or exceeded the quota for demographic characteristics. Of those contacted who met the eligibility criteria, the response rate was 57%. Although all reasonable attempts were made to have equal representation across the 4 major NZ ethnic groups, NZ Asians/Others were underrepresented (14%) compared to NZ Europeans, Māori, and Pacific people constituting 25%-33% of the sample. The majority of the participants (42%) were between 40 and 59 years of age, had completed at least high school education (97%), were employed (69%), and lived in urban areas (92%). The proportion of those who completed posthigh school/university level education was significantly lower in Māori and Pacific people compared to NZ Europeans, ($P = .006$ and $P < .001$, respectively). No other demographic factors were significantly different across the ethnic groups. Among ethnic groups, those with an income of NZ\$100,000 or greater per year was highest in NZ Europeans (39%), and lowest in Pacific people (22%; Online Supplemental Table 2). Forty-nine percent of the cohort had previous experience/knowledge of stroke among friends and family, and 3% had experienced a stroke personally.

When asked to name the most common causes of death, without a list of possible causes, the most common response was heart disease/attack (37%), followed by cancer (33%) with only 1.5% of participants naming stroke as a cause of death.

Table 1. Demographic characteristics of the survey sample

Variable	Category	n (%)
Age	<40	117 (29)
	40-59	168 (42)
	60+	115 (29)
Sex	Female	200 (50)
Ethnicity	NZ European	132 (33)
	Maori	110 (28)
	Pacific	98 (25)
	Asian/Other	57 (14)
	Refused to answer	3 (1)
Highest education	Primary/Intermediate School	4 (1)
	High school	145 (36)
	Attending/Attended University	46 (11)
	Vocational Qualification	92 (23)
	Bachelor's degree	76 (19)
	Higher degree	30 (8)
	Unknown/refused to answer	7 (2)
	Employment	Employed
	Not employed*	122 (30)
	Refused to answer	2 (1)
Income*	<NZD\$30,000 to US\$20,000	41 (10)
	NZD\$30,000-NZD\$50,000 to US\$20,001-US\$35,000	65 (16)
	NZD\$50,001-NZD\$70,000 to US\$35,001-US\$50,000	41 (10)
	NZD\$70,001-NZD\$100,000 to US\$50,001-US\$70,000	53 (14)
	NZD\$100,001-NZD\$140,000 to US\$70,000-US\$95,000	41 (10)
	>NZD\$140,001 to US\$95,001	39 (10)
	Unknown	93 (23)
	Refused to answer	27 (7)
Stroke experience in family/ friends	Yes	(74)

*Includes retirees, students, homemakers, volunteers.

Symptoms of Stroke

The awareness of stroke symptoms was evaluated using only a prompted method. The top panel in [Figure 1](#) shows the proportion of people who correctly identified stroke symptoms when prompted from a list of possible symptoms, whereas the bottom panel in [Figure 1](#) shows the proportion who incorrectly identified stroke symptoms from the same list of prompts. Sudden speech difficulty (94%) and sudden weakness on 1 side (92%) were the most commonly identified symptoms. Incorrect responses for symptoms that were unrelated to stroke ranged between 21% and 69%, eg, 45% of respondents identified chest pain as a stroke symptom.

When asked "Do you think you would be able to tell if someone was having a stroke?" 227 (57%) answered yes, 173 (43%) did not believe they would be able to tell or be

able to identify a person having a stroke. When prompted with a list of 11 options, 393 (98%) of participants identified 1 stroke symptom, 384 (96%) identified 2 or more, 342 (86%) identified 3 or more, 255 (64%) identified 4 or more and 146 (37%) identified all 5 of the correct symptoms in the list. All other correct stroke symptoms were significantly less likely to be correctly identified compared to sudden weakness/numbness in face, arm or leg or sudden difficulty in speaking/understanding others ($P < .0001$).

Effect of Education, Income, and Ethnicity on Awareness of Risk Factors

Overall, 138 (34.5%) participants correctly identified 1 of the top 5 risk factors of stroke, and 119 (30%) were able to identify 2 or more risk factors. The number of participants correctly identifying stroke risk factors when unprompted was 75% greater in those with university level qualifications compared to those who only had up to and including high school level education (OR = 1.75, 95% CI 1.14, 2.71). When unprompted, participants from households with middle income earnings were nearly twice as likely to correctly identify more stroke risk factors compared to low income household participants (OR = 1.84, 95% CI 1.16, 2.93). Compared to NZ Europeans, the number of correctly identified stroke signs or symptoms were less in Pacific peoples and Māori (OR = 0.47, 95% CI .29, .77 and OR = .57, 95% CI .36, .97, respectively, see [Table 2](#)). Pacific people were also 58% less likely to correctly identify stroke risk factors, when compared to NZ European (OR = .42, 95% CI .26, .66). No other significant ethnic differences were seen when participants were asked to identify stroke risk factors. In our sample, there was no statistical interaction between ethnicity and SES. However, there was a statistical interaction between ethnicity and educational attainment, specifically in Pacific peoples ($P = .001$). There was a significant difference in Pacific people with a high school education or those who are attending/attended university or with a vocational qualification compared with a degree education ($P = .000$ and $.009$ respectively).

When identifying the top 5 stroke risk factors, significant differences were seen in the number of correct responses given by education, income, and ethnicity ($P = .0276$, $P = .0134$, and $P = .0148$, respectively; see [Fig. 2-4](#)).

The most commonly identified top 5 stroke risk factor was high blood pressure, followed by smoking, poor diet, no exercise, and high cholesterol. There was no difference in the proportion of participants who identified high blood pressure versus smoking as a top 5 risk factor (.28, $P = .40$). There were differences between the proportion of participants who identified high blood pressure as a top 5 risk factor (.31) versus high cholesterol (.11, $P < .0001$), not exercising (.16, $P < .0001$), and poor diet (.16, $P < .0001$).

When asked what a person could do to reduce their chances of having a stroke (see Online Supplemental

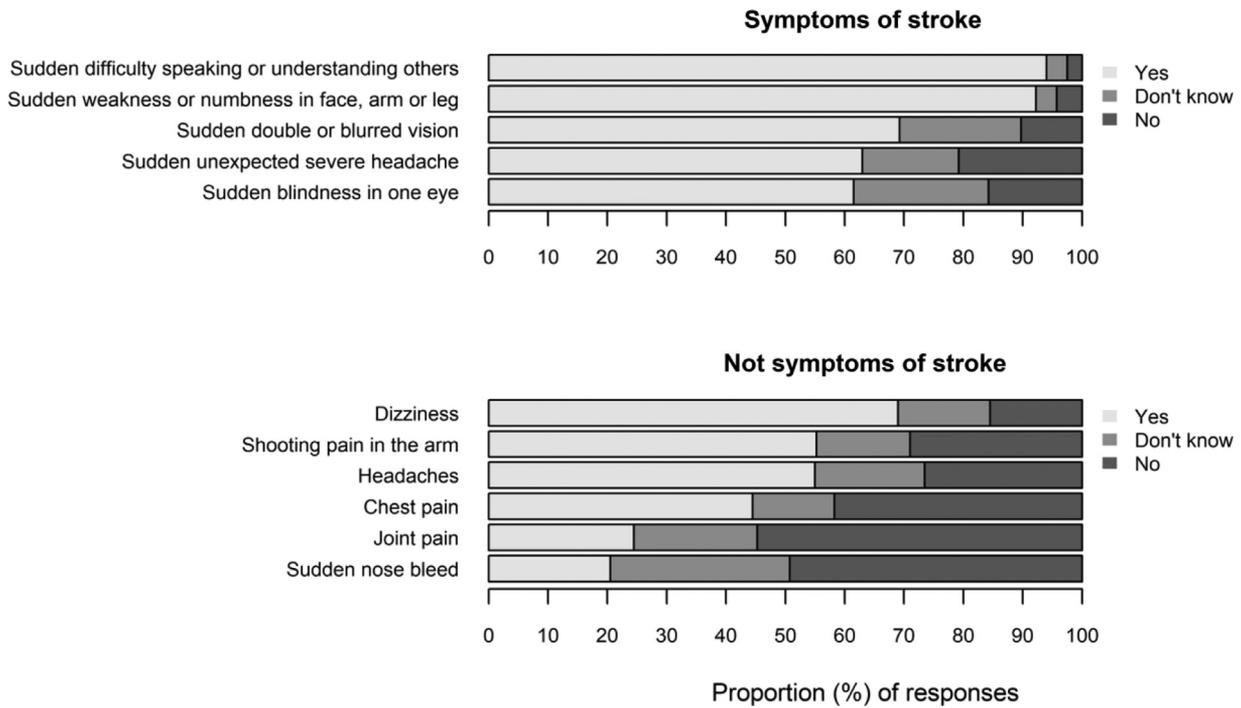


Figure 1. Prompted questions: frequency of people responding “Yes” symptom related to stroke (%).

Table 3) the most common response was to participate in regular or increase physical activity (32%) followed by eat more fruits and vegetables/have a healthier diet (22%) and to stop smoking (13%). Reducing salt intake (1%) and not knowing how to reduce the chances of having a stroke (2%) were the least frequent responses.

In terms of resources for information on stroke, participants were asked which organizations they know of that provided stroke information. The most frequent responses were the Stroke Foundation (21%) and their doctor or general practice (14%). However, 39% of participants were unable to name any organizations that provide

Table 2. Awareness of stroke symptoms and top 5 correctly identified stroke risk factors by education, income and ethnicity

Question	Categories	OR (95% CI)	
Awareness of stroke symptoms	<i>By education level</i>	Attending/Attended University/Vocational qualification versus High school	1.05 (0.69, 1.59)
		University/Higher degree versus High school	1.29 (0.82, 2.03)
		Don't know/Refused versus High school	1.98 (0.54, 8.15)
	<i>By income level</i>	Mid income versus low income	1.44 (0.91, 2.30)
		High income versus low income	1.90 (1.00, 3.70)
		Don't know/Refused versus low income	0.95 (0.61, 1.47)
	<i>By ethnicity</i>	Maori versus NZ European	0.57 (0.36, 0.97)
		Pacific versus NZ European	0.47 (0.29, 0.77)
		Asian/Other versus NZ European	0.64 (0.37, 1.12)
		Refused to answer versus NZ European	0.45 (0.73, 2.76)
Awareness of stroke risk factors	<i>By education level</i>	Attending university versus high school	1.35 (0.90, 2.05)
		University degree versus high school	1.75 (1.14, 2.71)
		Don't know/Refused versus high school	0.51(0.12, 2.02)
	<i>By income level</i>	Mid income versus low income	1.84 (1.16, 2.93)
		High income versus low income	1.32 (0.72, 2.42)
		Don't know/Refused versus low income	1.10 (0.72, 1.70)
	<i>By ethnicity</i>	Maori versus NZ European	0.90 (0.57, 1.41)
		Pacific versus NZ European	0.42 (0.26, 0.66)
		Asian/Other versus NZ European	0.89 (0.51, 1.53)
		Refused to answer versus NZ European	0.39 (0.05, 2.71)

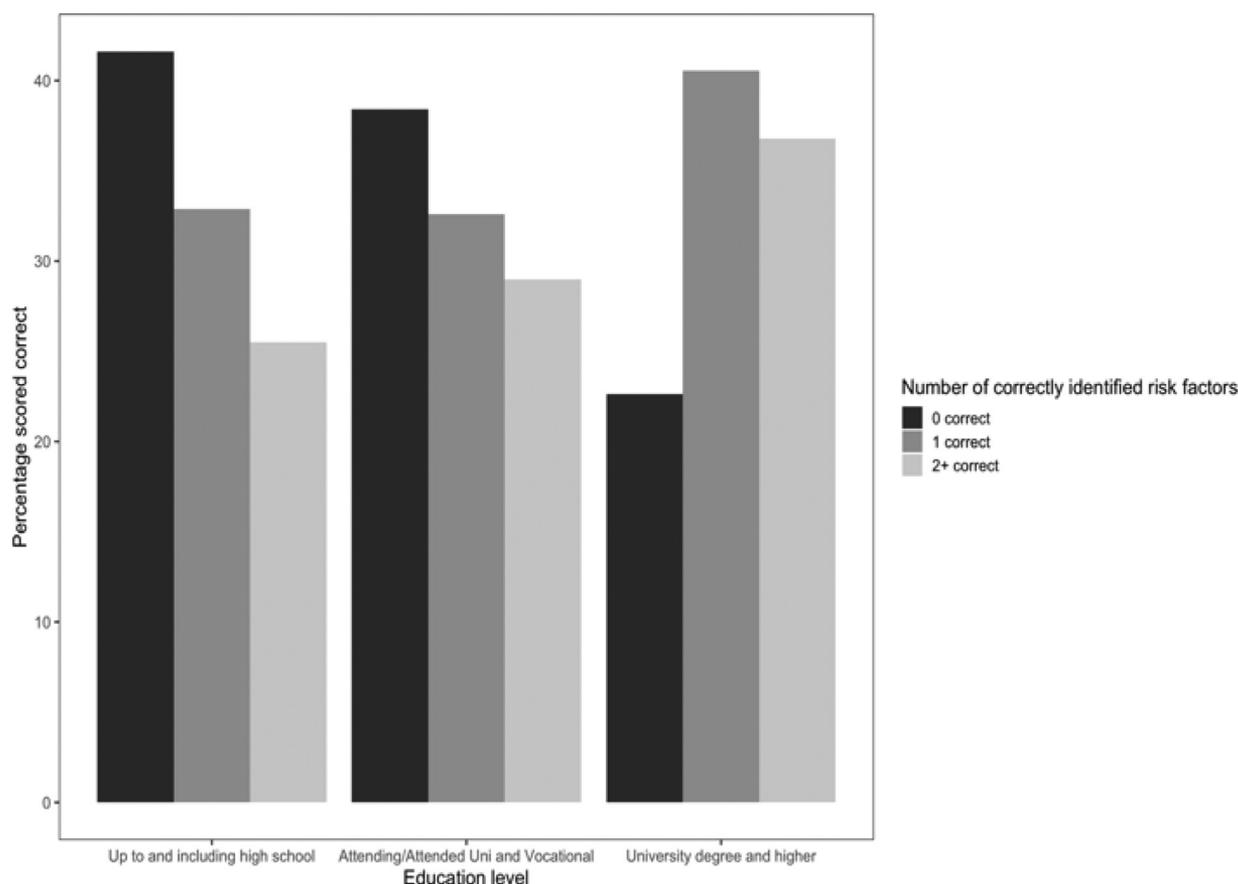


Figure 2. Percent of correctly identified top 5 stroke risk factors by education.

information about stroke. Forty-four percent of respondents (177 of 400) said they had seen something relating to stroke in the past year; 26% cited newspapers, magazines, television, and radio as their main sources of information, while 24% identified family and friends, their doctor or hospital, and the internet as their sources of information.

In response to the question "If you or someone you know has any symptoms of a stroke, what should you do?" 80% said they would call the ambulance or emergency services. However, 20% said they would either call or visit their general practitioner, manage the condition themselves (eg, by lying down and waiting), or did not know what to do.

Discussion

This survey shows that stroke awareness is high for the most common stroke symptoms and risk factors when prompted with a list of possible responses. However, we found that unprompted questioning resulted in findings of lower awareness, low overall community awareness for stroke risk factors, with some ethnic differences evident. There was a 10-fold decrease in the proportion of people able to identify 5 common risk factors compared to prompted responses, which may be a more accurate

reflection of the level of awareness. It is possible however, that difficulty in recalling risk factors rather than a lack of knowledge per se may lead to the underestimation of awareness. Recognition of stroke symptoms was similar to other studies where 1-sided weakness in the face or limbs was by far the most common symptom identified. In a Norwegian study, 67% of people identified 1-sided weakness as a stroke symptom, and 46% identified confusion or a speech problem, which is higher than in our study.¹⁷ Vision and speech problems were not well recognized as stroke symptoms. The recognition of stroke as a common cause of death was low, well below cancer and heart disease. This may be partially due both to the low level of awareness of stroke as a cause of death in general, and to the higher public profile of cancer and heart disease in the media, and in screening and fundraising campaigns. Responding to a list of possible answers resulted in a large proportion of incorrect responses (eg, identifying chest pain as a symptom of stroke). This suggests that prompting responses may artificially inflate the proportion of correct responses, as seen in other studies.^{18,19}

Our findings suggest that public health messages on the importance of modifiable risk factors, particularly blood pressure control for stroke prevention, need to be significantly enhanced. There is strong evidence from the Global

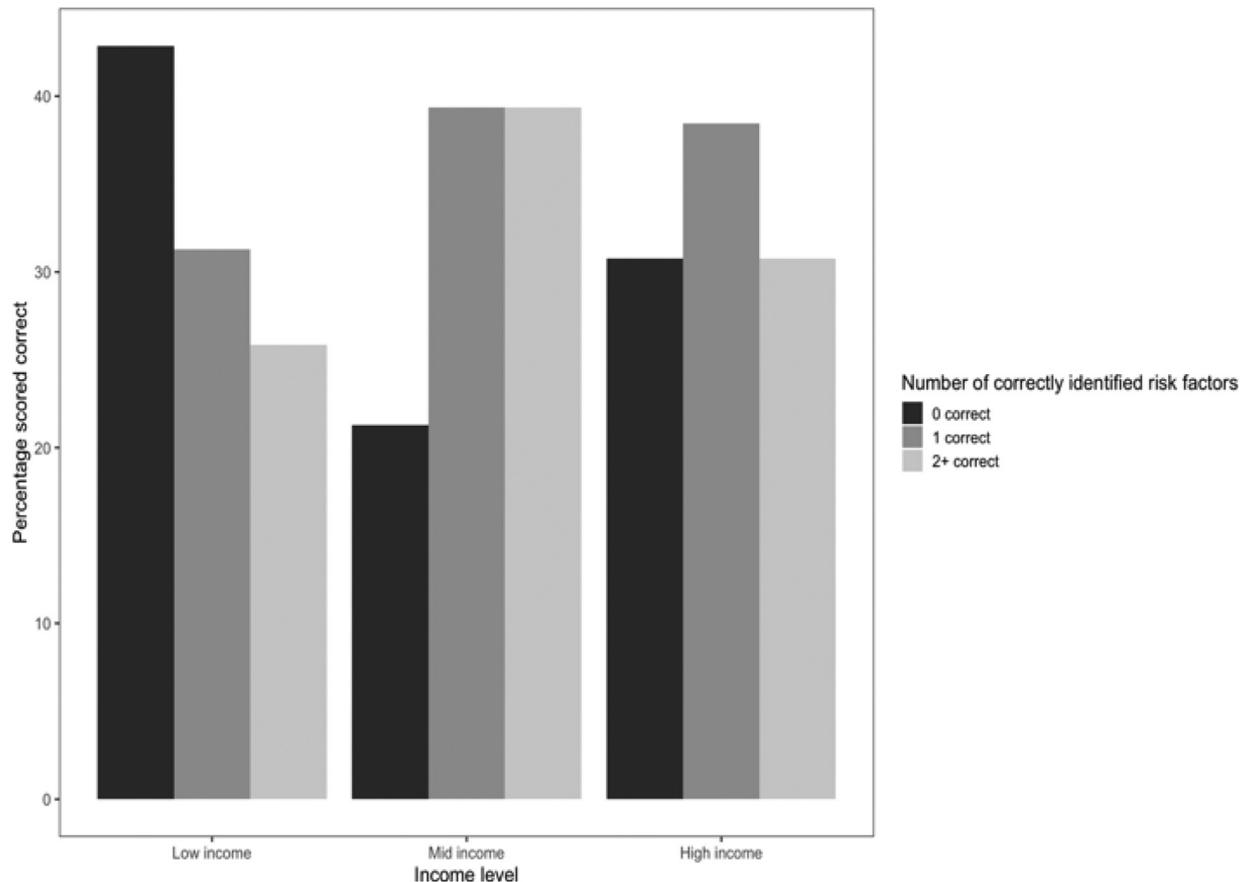


Figure 3. Percent of correctly identified top 5 stroke risk factors by income. *Low income (up to NZD \$70,000 to USD \$50,000); mid income (NZD \$70,001-NZD \$140,000 to USD \$50,001-USD \$95,000); high income (over NZD \$140,001 to USD \$95,000).

Burden of Disease (GBD) studies that 90% of the burden of stroke in terms of disability adjusted life-years (DALYs) is attributed to modifiable risk factors, with over 70% attributed to lifestyle risk factors. The GBD studies showed that high systolic blood pressure was the leading contributor of DALYs for stroke, followed by a diet low in fruits.¹⁶ Encouragingly, a fairly large proportion of participants stated that eating more fruits and vegetables and eating healthier in general could reduce the risk of stroke. However, in reality, the consumption of fruits in the NZ population is low, with only 36% eating the recommended 3 servings per day.²⁰ The cost of fruits and vegetables can be a barrier, particularly in low-income households.²¹ The increased consumption of fruits and vegetables can be encouraged both by heightening the awareness of the importance of a healthy diet and by making healthier foods more affordable.

Stratification of the survey by the 4 major NZ ethnic groups identified ethnic differences in stroke awareness, particularly for Pacific and Māori people. Similar findings were also observed in a survey of an urban NZ population,⁵ as well as other ethnic minority populations.^{22,23} A population-based door-to-door survey in Spain found that

being younger, more educated, and having a higher income were associated with greater stroke awareness.²⁴ Given that higher education was associated with better awareness in our study, comparatively lower educational attainment in Pacific peoples may have contributed to our finding of low awareness in this group. Moreover, the combined effect of a lower educational attainment with lower income further compounds the disparities, due to decreased affordability of healthy foods. Low functional health literacy is also associated with low stroke awareness, as the comprehension of health-related materials is inadequate.²⁵ English is commonly a second language in Asian and Pacific peoples, particularly in older populations. The low health literacy seen may have resulted partly due to a language barrier, as well as lower levels of education, in these groups. This suggests the need for developing language-specific and culturally tailored educational material and methods of delivery of information, in order to successfully increase awareness in these communities. Training people from individual ethnic groups to disseminate educational material via avenues that are relevant (such as churches for Pacific communities) has the potential to increase the access and uptake of stroke information.

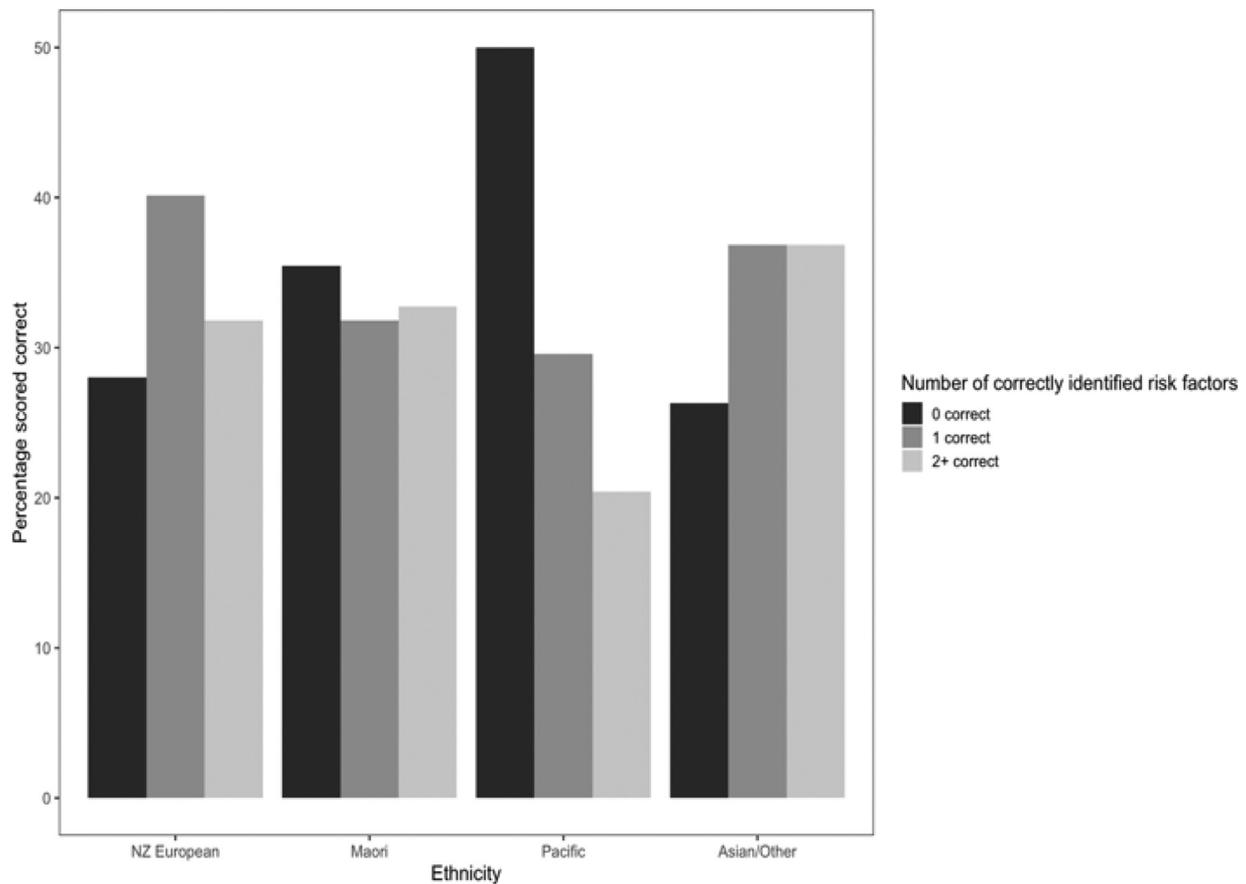


Figure 4. Percent of correctly identified top 5 stroke risk factors by ethnicity.

Important risk factors including high blood pressure, smoking, and diabetes were identified by a small proportion of people. Targeted campaigns that focus on the importance of lifestyle are needed to improve the understanding of the link with stroke risk. In terms of actions to take if a stroke occurs, 80% of participants stated they would call an ambulance. However, this figure is likely to overestimate the proportion of patients who actually access care through an urgent prehospital pathway. Previous studies have shown that the intention to seek help from the emergency medical services in acute stroke does not translate to action.^{26,27} Reasons for not activating an ambulance response include failure to recognize the seriousness of the condition, waiting for the symptoms to improve spontaneously or accessing care from a general practitioner or by presenting at a hospital. It is likely that this figure overestimates the proportion of patients accessing care through an urgent prehospital pathway.

The major strength of the study was that this survey was conducted in a stratified national sample, with almost equal representation of the major ethnic groups. Second, the survey was conducted in the absence of any concurrent major national stroke awareness campaigns, thus allowing the testing of baseline awareness. Our study had some limitations. First, the survey was conducted using landline

numbers only. This may have inevitably biased the sample towards a higher SES population, those without a mobile telephone, those with a disability, as many people in low SES areas tend not to have landlines due to cost. A high proportion of Māori and Pacific peoples use mobile phones and hence may have been missed out of this survey. The survey was conducted in the English language only, thus missing out on data from non-English speaking people who tend to be predominantly older. The awareness of stroke was captured only in the prompted method, which may have overestimated the level of awareness. Future surveys can be improved based on the learnings of this study. The sample represented 10% of the initial contacts, hence sampling bias is a limitation of the study. A survey with a much larger sample size is needed in future to better represent the demographic diversity of NZ. Participants were not asked how they would respond to specific symptoms—adding this level of detail in a future survey would further enhance the data on individual responses. Future surveys should include both prompted and unprompted methods.

Summary and Conclusions

The low level of stroke awareness especially in Pacific peoples, and those with low education and income needs

to be urgently addressed. This is of particular importance in NZ given the disproportionately high burden of stroke in Māori and Pacific peoples. The effect of a recent nationwide media campaign of stroke awareness focused on F.A.S.T. symptoms conducted in 2017 would be of interest to evaluate the efficacy of this campaign particularly in Māori, Pacific, and Asian peoples. Culturally tailored campaigns and interventions, with the involvement of community groups with high access to Māori, Pacific, and Asian peoples as well as large scale media campaigns are needed to enhance awareness.

Conflict of Interest: None.

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.jstrokecerebrovasdis.2019.104589](https://doi.org/10.1016/j.jstrokecerebrovasdis.2019.104589).

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