



Archived at the Flinders Academic Commons:

<http://dspace.flinders.edu.au/dspace/>

This is the peer reviewed version of the following article:

Tang, N. & MacDougall, C. J Public Health (2015) 23: 157. ,

The final publication is available at Springer via

<http://dx.doi.org/10.1007/s10389-015-0666-7>

© Springer-Verlag Berlin Heidelberg 2015

# **Alcohol Consumption Change of English, French and Chinese Speaking Immigrants in Ottawa and Gatineau, Canada**

**Ning Tang, Colin MacDougall**

Discipline of Public Health, Flinders University, Australia

## **Background**

Alcohol consumption and heavy drinking differed between immigrants and Canadian-born residents and varied with length of residence in Canada (Pérez 2002). Generally, Canadian immigrants showed lower rates of alcohol consumption and binge drinking than Canadian-born residents (Ali 2002; McDonald 2005). In particular, English and French speaking immigrants from Africa had the lowest rates of alcohol dependence in Canada (Statistics Canada 2002). However, alcohol consumption of some of immigrant men increased with years spent in Canada, but no significant change was observed in immigrant women (McDonald 2006). The majority of Canadian immigrant youth aged 15 to 25 drank alcohol occasionally (Mulira 2010). A study exposes that immigrant youth who have been in Canada for less than 10 years are less likely to drink than Canadian-born youth (Kunz 1999). No study has compared alcohol consumption between different cultural immigrant groups or sub-groups in literatures and reports.

English speaking immigrants represent one of the largest ethnic or cultural immigrant sub-groups in Canada and are the largest immigrant sub-groups in the Ottawa (Ontario) – Gatineau (Québec) region (Statistics Canada 2009a, Statistics Canada -census 2011), while French speaking immigrants are one of principal ethnic immigrant groups in Québec and the second largest immigrant sub-group in the region (Roy et al. 2007, SC 2009a, Statistics Canada-census 2011). Chinese speaking Canadians have constituted the largest ethnic immigrant sub-group entering Canada, one of the fastest-growing sub-groups in Canada since 1987 and the fourth largest sub-group following Arabic speaking immigrants in the Ottawa – Gatineau region (Man 2004, Lu 2008, Statistics Canada -census 2011).

The main objectives of this study were to explore the differences in Drinking Change among different sub-groups of immigrants as well as to explore the correlations and relationships between Drinking Dependent Variables (Drinking Behaviour Change and Drinking Belief Change) and Demographic Independent Variables (Mother Tongue, Age, Gender, Category of Immigration, Duration of Residence in Canada). The explorations show far-reaching significance in multicultural health research, health care, health policy-making and health promoting program in Canada.

## **Methods**

## Survey Method

English, French and Chinese speaking immigrants at Adult Educational Centres/Schools, Christian Community Churches and Residential Communities in Gatineau and Ottawa of Canada were identified as the target population of this multicultural cross-sectional study. Random sampling was deemed impracticable for the study and could bring greater bias because immigrant status of these three ethnic sub-groups could not be identified effectively according to the sampling criteria. Purposive-sampling method was therefore applied in the multicultural study to recruit qualified immigrant participants [RMKB 2006, Statistics Canada 2010]. The participants must have been 18 years or more, have resided in Ottawa or Gatineau one year or more, and had been 16 years or more when they arrived in Canada. In total, 810 qualified English, French and Chinese volunteer immigrant participants were recruited to the study. Using self-reports, all participants answered questions regarding Alcohol Consumption Change / Drinking Change and Demography in the Multicultural Lifestyle Change Questionnaire in either the English, French or Chinese versions developed by the authors. The Multicultural Lifestyle Change Questionnaire was demonstrated by a pilot-test in the three immigrant sub-groups to have high validity (Pearson correlation coefficient  $r = 0.435 >$  satisfactory value 0.40) [Eshaghi et al. 2006; Ekeberg et al. 2008], and reliability (alpha coefficient  $\alpha = 0.754 >$  satisfactory value 0.70) before the multicultural study [Grau 2007; Hopkins et al. 2010].

Drinking subjects were defined as the sum total of drinking subjects before immigration, drinking subjects after immigration and drinking subjects both before immigration and after immigration.

Drinking Change included Drinking Behavior Change and Drinking Belief Change (dependent variables). Drinking Behavior Change was identified based on response option of the drinking question in the Multicultural Lifestyle Change Questionnaire – “Which of the following best describes you?”. The answer options for the question were as follows: “A. You have never drunk alcohol (including any alcoholic beverage)”, “B. You drank alcohol before arrival in Canada, but quit after arrival”, “C. You did not drink alcohol before arrival in Canada, but began to drink alcohol after arrival”, and “D. If you drank alcohol both before arrival and since arrival in Canada, go to questions below” the section on drinking quantity. The respondent was identified experiencing Drinking Behavior Change if choosing option “B” or “C”.

Drinking quantities before and after immigration were identified according to the response choices for two questions of drinking quantity in the Questionnaire – “In the last year before arrival in Canada, on average, how much alcohol (beer, wine) did you drink each day?” (question one) and “In the past year in Canada, on average, how much alcohol (beer, wine) did you drink each day?” (question two). The response options for both of the two questions were as follows: “a. 1/2 bottle of beer or less, or a glass of wine or less”, “b. 1 – 1.5 bottles of beer, or 2 – 3 glasses of wine”, “c. 2 – 3 bottles of beer, or 4 – 6 glasses of wine”, “d. 4 bottles of beer or more, or 7 – 8 glasses of wine or more”, and “e. Do not know”. The

respondent was also identified experiencing Drinking Behavior Change if there were different choices in the options of two questions except option “e” (i.e. picking option “a” for question one and choosing option “b” for question two).

Drinking Belief Change was identified based on the response choices for two drinking belief questions in the Questionnaire – “Before arrival in Canada, which of these statements best describes your belief with regards to drinking alcohol?” (question one) and “Since arrival in Canada, which of these statements best describes your belief with regards to drinking alcohol?” (question two). The same alternatives of two questions were as follows: “A. Excessive drinking of alcohol is **extremely bad** for health”, “B. Excessive drinking of alcohol is **very bad** for health”, “C. Excessive drinking of alcohol is **bad** for health”, “D. Excessive drinking of alcohol is **somewhat bad** for health”, “E. Excessive drinking of alcohol is **less than somewhat bad** for health”, “F. Excessive drinking of alcohol is **not bad** for health”, and “G. Do not know”. The respondent was identified experiencing Drinking Belief Change if there were different choices in the alternatives of two questions except option “G” (i.e. picking option “A” for question one and choosing option “B” for question two).

Immigrant status of English or French or Chinese speaking subjects was identified by the response for the “Original Country” question in the Questionnaire – “What is your country of origin?”.

Demographic characteristics (independent variable) of the study population were identified according to the response choices for the demographic questions relating to “Mother Tongue”, “Speaking Language”, “Age”, “Gender”, “Marital Status”, “Category of Immigration”, “Duration of Residence”, “Education”, “Employed Status”, “Employed Status”, “Occupation”, “Religion” and “Income” in the Questionnaire.

Data in Drinking were analyzed statistically for the different immigrant sub-groups.

### **Data Analysis Method**

Rate of drinking was calculated including, respectively, Drinking Rate, Drinking Rate Before Immigration, Drinking Rate After Immigration, Drinking Change Rate, Drinking Belief Change Rate in the Sampled Immigrant Subjects, the Gender (Man and Woman) Sub-groups, the Language (English, French and Chinese) Sub-groups and the Category (Principal Applicant Immigrant, Spouse and Dependant Immigrant, Family Class Immigrant, Other / Refugee Immigrant) Sub-groups.

Chi-square tests were performed to test if there were significant differences between the rates for different sub-groups in Drinking.

Following the descriptive analysis, correlation analysis was performed to test if there were correlation between demographic (independent) variables - Mother Tongue, Age, Gender, Category of Immigration, Duration of Residence in Canada, and drinking (dependent) variables - Drinking Change (Drinking Behavior Change + Drinking Belief Change) and Drinking Behavior Change. The objectives were to

measure the correlations between the independent variables and the dependent variables. Finally, multiple /multivariable linear regression analysis was used to determine if the independent variables had significantly impacted the dependent variables.

### Ethical Approval

The immigrant drinking change study was part of a multicultural lifestyle change research project that was approved by the Flinders University Social and Behavioural Research Ethics Committee in Australia in 2010 and by Office of Research Ethics and Integrity, University of Ottawa in Canada in 2014.

### Results

#### Percentages in Drinking

The rates in Drinking were calculated as: Drinking Rate = drinking subjects before immigration + drinking subjects after immigration + drinking subjects both before immigration and after immigration / sampled subjects x 100%; Drinking Rate Before Immigration = drinking subjects before immigration / sampled subjects x 100%; Drinking Rate After Immigration = drinking subjects after immigration / sampled subjects x 100%; Drinking Change Rate = drinking subjects before immigration + subjects of increasing or decreasing alcohol consumption after immigration / sampled subjects x 100%; Drinking Belief Change Rate = subjects of Drinking Belief Change after immigration / sampled subjects x 100%.

Table 1 presents the Drinking Change by population sub-groups.

Table 1: *Immigrant Drinking Change Rate*

Item		Alcohol Consumption / Drinking				
		Drinking Rate %	Drinking Rate Before Immigration %	Drinking Rate After Immigration %	Drinking Behavior Change Drinking Change Rate %	Drinking Belief Change Drinking Belief Change Rate %
Total Sample (810)		50.25	39.14	43.21	29.75	37.41
Gender Sub-groups	Immigrant Men (411)	65.94	51.09	59.61	39.42	43.07
	Immigrant Women (399)	34.34	26.82	26.07	19.05	31.58
Language Sub-groups	English Immigrants (278)	47.12	30.94	41.01	28.78	27.34
	French Immigrants (268)	61.19	47.76	51.87	35.45	45.52
	Chinese Immigrants (264)	42.80	38.43	35.99	23.49	39.77
Category Sub-groups	Principal Applicant Immigrants (193)	63.21	55.96	55.96	32.12	41.97
	Spouse and Dependent Immigrants (193)	39.38	26.94	34.20	22.80	34.20
	Family Class Immigrants (354)	47.18	35.88	40.11	29.94	36.16
	Refugee Immigrants (70)	61.43	42.86	47.14	37.14	40.00

**Significance Level:**

Table 2 presents significance level of Rates in Drinking.

Table 2: Significance Level of Rates in Drinking

Item	Chi-square	p-value	Significant Difference
Rates for Male and Female Immigrant Sub-groups in Drinking	11.000	0.358	No
Rates for English, French and Chinese Immigrant Sub-groups in Drinking	30.000	0.363	No
Rates for Principal Applicant, Spouse and Dependent, Family Class, Other/Refugee Immigrant Sub-groups in Drinking	60.000	0.182	No

Notes: Significance Level:  $P < 0.05$

**Multivariate analysis (correlation and regression analysis)**

Table 3 presents multivariate (correlation and regression) analysis results in Drinking Change.

Table 3: Multivariate Analysis Results of Immigrant Drinking Change

Correlation Analysis					Multiple Linear Regression Analysis			
Dependent Variable	Independent Variable	Pearson's r	p-value	Correlation between Independent Variable and Dependent Variable	Dependent Variable	Independent Variable	p-value	Impact of Independent Variable on Dependent Variable
Drinking Change (Drinking Behavior Change + Drinking Belief Change)	Mother Tongue	0.127	0.000	Positive Correlation	Drinking Change (Drinking Behavior Change + Drinking Belief Change)	Mother Tongue	0.000	Significant Impact
	Gender	-0.238	0.000	Negative Correlation		Gender	0.000	Significant Impact
Drinking Behavior Change	Gender	0.121	0.001	Negative Correlation	Drinking Behavior Change	Gender	0.000	Significant Impact
	Category of Immigration	-0.086	0.014	Negative Correlation				

Notes: Significance Level:  $P < 0.05$

**Discussion**

**Total Sample**

The results regarding Drinking show that the immigrants in Ottawa and Gatineau, Canada had higher Drinking Rate (50.25%), Drinking Rate Before Immigration (39.14%) and Drinking Rate After Immigration (43.21%). Most of immigrants increased consumption of alcohol because their drinking rate after immigration was higher than drinking rate before immigration. 29.75% of Immigrants experienced drinking behavior change. However, 37.41% of immigrants changed drinking belief after immigration. It is worth to note that drinking belief change rate of the immigrants was higher than their drinking behavior change rate, which discloses that drinking belief change was not compatible with drinking behavior change. It seems that drinking behavior and drinking belief have different level of acculturation (Pedersen et al. 2011). Acculturation has been broadly described as “the process by which immigrants adopt the attitudes, values, customs, beliefs, and behaviors of a new culture” (LaFromboise et al. 1993; Pérez-Escamilla and Putnik 2007). Acculturation is an indication of the cultural change of minority individuals to the majority culture (Mainous et al. 2008). Drinking belief could have higher acculturation level than drinking behavior. Because of difference of original culture, some of immigrants could have higher acculturation level of drinking behavior, others could have higher acculturation level of drinking belief. Some of immigrants who changed drinking belief did not change their drinking behavior.

In the multicultural study data, Drinking Rate (50.25%) and Drinking Rate (43.21%) After Immigration of the immigrants were greatly lower than Alcohol “Lifetime Use” Rate (91.0%) and Alcohol “Past 12 month Use” Rate (78.4%) of Canadian citizen (aged 15 or more) in 2012 Canadian Alcohol and Drug Use Monitoring Survey (HC-Alcohol 2013). Therefore, Drinking Rate After Immigration of the immigrants was lower than “Current Alcohol Use” Rate of Canadian citizen.

It is known that drinking change was associated with drinking acculturation (Caetano and Mora 1988; Pedersen et al. 2011). Acculturation was negatively associated with alcohol use (Parikh 2009). Some of studies reveal that acculturation might drive drinking change, and higher acculturation was associated with a greater likelihood of high alcohol intake (Su et al. 2002; Abraido-Lanza et al. 2005). Some of researchers indicate that the association between acculturation and alcohol use disorders did not appear to be linear and the effect of acculturation was not uniform on individuals' drinking behavior (Caetano et al. 2008).

### **Gender Sub-groups**

The data reveal that different immigrant gender sub-groups had different rates in drinking or alcohol consumption. All of rates (Drinking Rate, Drinking Rate Before Immigration, Drinking Rate After Immigration, Drinking Change Rate, Drinking Belief Change Rate) of male immigrants were higher than those of female immigrants. It appears that male immigrants faced or encountered more challenging and had more psychological pressure after immigration, and they had greater drinking change.

Drinking Rate (65.94%) and Drinking Rate (59.61%) After Immigration of male immigrants in the multicultural survey were greatly lower than Alcohol “Lifetime Use” Rate (92.0%) and Alcohol “Past 12

month Use” Rate (82.7%) of male Canadian citizen (aged 15 or more), and Drinking Rate (34.34%) and Drinking Rate (26.94%) After Immigration of female immigrants were greatly lower than Alcohol “Lifetime Use” Rate (89.3%) and Alcohol “Past 12 month Use” Rate (74.4%) of female Canadian citizen (aged 15 or more) in 2012 Canadian Alcohol and Drug Use Monitoring Survey (HC-Alcohol 2013). Thus, Drinking Rates After Immigration of male and female immigrants could be respectively lower than “Current Alcohol Use” Rates of male and female Canadian citizen.

Some of studies show that acculturation has different effects on drinking for men and women (Caetano et al. 2008 Feb.; Vaeth et al. 2012). Research findings disclose that acculturation effects on drinking outcomes were stronger for female immigrants than male immigrants (Mill et al. 2012). Similarly, acculturation has a direct effect on drinking status for women but not for men (Alaniz et al. 1999). Further, acculturation had a more consistent association with increased drinking and binge drinking among women than among men (Vaeth et al. 2012). For example, higher acculturation was positively associated with a higher probability of drinking (vs. abstinence) among Latino immigrant women, and higher average volumes and more frequent drunkenness among Latino immigrant female drinkers, but acculturation was unrelated to alcohol use among Latino immigrant men (Zemore 2005). Therefore, the effect of acculturation was gender-specific in drinking (Vaeth et al. 2012). However, the results of the multicultural drinking study reveal that drinking change rate of immigrant men was higher than that of immigrant women, which did not support that immigrant women had higher level of drinking acculturation.

### **Language Sub-groups**

The data exhibit that different immigrant language sub-groups had different rates in drinking. Amongst the three immigrant language sub-groups, French immigrants had the highest rates in Drinking, while English Immigrants had the lowermost Drinking Rate Before Immigration (30.94%) and Drinking Belief Change Rate (27.34%). However, Chinese immigrants had the lowermost Drinking Rate (42.80%), Drinking Rate After Immigration (35.99%) and Drinking Change Rate (23.49%). It is obvious that French immigrants had the greatest drinking behavior change, English immigrants followed French immigrants, and Chinese immigrants exhibited the least drinking behavior change. Drinking Rate of Chinese immigrants decreased after immigration, but Drinking Rates of English and French immigrants increased.

Meanwhile, the results reveal that French immigrants had the highest Drinking Belief Change Rate (45.52%) or the greatest drinking belief change, while Chinese immigrants had lower Drinking Belief Change Rate (39.77%) or less drinking belief change. However, English immigrants had the lowermost Drinking Belief Change Rate (27.34%) or the least drinking belief change. Evidently, because of environmental change, immigrants experienced drinking belief change, while different ethnic and cultural sub-groups exhibited different changes.



It appears that culture is an important factor impacting drinking behavior and drinking change as pertains to the ethnic or language sub-groups. Some of research findings show that alcohol use patterns and prevalence of alcohol-related problems varied among foreign-born immigrants by racial and ethnic backgrounds (Galvan and Caetano 2003; Kim 2005). For example, Iranian immigrants in Oslo, Norway reported a higher drinking frequency than Turkish and Pakistan immigrants (Amundsen 2012). For other example, Chinese immigrant adolescents from mainland China living in the United States were less likely to be drinkers than adolescents from the other two sub-cultures (Chinese adolescents from Hong Kong and American-born Chinese adolescents) (Lo and Globetti 2001).

Original culture impacted drinking patterns of different ethnic groups or sub-groups (Caetano and Mora 1988), or ethnic drinking cultures may significantly influence alcohol use (Cook et al. 2012). Asian immigrants in the US had high rates of alcohol abstention and low rates of heavy alcohol use (Caetano and Mora 1988), but different subgroups of Asian-Americans varied substantially in their rates of drinking and heavy drinking (Caetano et al. 1998). For instance, Southeast Asian immigrants (e.g., Vietnamese) living in the US appeared to be at high risk for heavy drinking (Makimoto 1998). Meanwhile, number of days of drinking of Latino immigrants in the US declined significantly post-immigration (De La Rosa et al. 2013), but Hispanic subgroups had substantial differences in drinking patterns and rates of alcohol-related problems (Caetano et al. 1998). For example, Mexican-Americans reported drinking more often and in greater quantities than Central Americans, and the proportion of "high" drinkers was higher among Mexican-Americans than among the Central Americans (Marin 1995). Moreover, Mexican-Americans exhibited more alcohol-related problems than did Cuban-Americans and Puerto Ricans (Caetano 1988), and Mexican American and Puerto Rican men having higher rates of alcohol abuse and dependence than Cuban American and South/Central American men (Caetano et al. 2008 May).

It seems that immigrants of different language sub-groups had different level of drinking acculturation, which resulted in their different Drinking Rates After Immigration and different drinking change. Chinese immigrants had the least Drinking Rate After Immigration and greater drinking change, which appears that they have lower level of drinking acculturation than English and French immigrants. A study reveal that greater levels of past drinking were associated with more acculturation into the mainstream U.S. society for the Hispanic veterans (Verney 2007). Other study exhibit that first generation South Asians and linguistically acculturated Vietnamese were at an increased risk of binge drinking (Becerra et al. 2013). However, Latino young immigrants with no prior history of alcohol consumption remained largely unaffected by these acculturation-related variables, but young immigrants with a previous history of alcohol consumption experienced greater likelihood of binge drinking as a function of the acculturation-related variables (Guilamo-Ramos et al. 2004).

Meanwhile, language preference and English language proficiency may exhibit different drinking impacting effects on different linguistic or ethnic immigrant sub-groups. For example, Spanish-speaking Hispanics were significantly less likely to binge drink than English-speaking Hispanics (DuBard 2008).

### **Category Sub-groups**

The study results expose that different immigrant category sub-groups had different rates in drinking. Among the four immigrant category sub-groups, Principal Applicant Immigrants had the highest Drinking Rate (63.21%), Drinking Rate Before Immigration (55.96%) and Drinking Rate After Immigration (55.96%), while Spouse and Dependent Immigrants had the lowermost rates in Drinking. It is known that Drinking Rate (61.43%), Drinking Rate Before Immigration (42.86%) and Drinking Rate After Immigration (47.14%) of Other (Refugee) Immigrants were lower than those of Principal Applicant Immigrants, but higher than those of Family Class Immigrants and Spouse and Dependent Immigrants. Drinking Rate (47.18%), Drinking Rate Before Immigration (35.88%) and Drinking Rate After Immigration (40.11%) of Family Class Immigrants were higher than those of Spouse and Dependent Immigrants.

However, the result reveal that Other (Refugee) Immigrants had the highest Drinking Change Rate (37.14%) and the greatest Drinking Change, while Principal Applicant Immigrants had the second high Drinking Change Rate (32.12%) and the second great Drinking Change. Drinking Change Rate (29.94%) of Family Class Immigrants was lower than that of Other (Refugee) Immigrants and Principal Applicant Immigrants, but higher than that of Spouse and Dependent Immigrants. It is apparent that Spouse and Dependent Immigrants had the lowermost Drinking Change Rate (22.80%) and the least Drinking Change. However, except Drinking Rate of Principal Applicant Immigrants, Drinking Rates of immigrants of other three sub-groups increased after immigration.

Meanwhile, the results of this drinking study expose that Principal Applicant Immigrants had the highest Drinking Belief Change Rate (41.97%), while Other (Refugee) Immigrants had slightly lower Drinking Belief Change Rate (40.00%). Drinking Belief Change Rate (36.16%) of Family Class Immigrants was lower than that of Principal Applicant Immigrants and Other (Refugee) Immigrants, but higher than that (24.20%) of Spouse and Dependent Immigrants. Obviously, immigrant category sub-group of the largest drinking belief change was Principal Applicant Immigrants, the second one was Other (Refugee) Immigrants, and the third one and least one were respectively Family Class Immigrants and Spouse and Dependent Immigrants. It seems that Principal Applicant Immigrants accepted more easily Canadian culture and foreign culture and had higher drinking acculturation. They had higher drinking belief change. On the contrary, more Family Class Immigrants and Spouse and Dependent Immigrants kept their original drinking belief. However, it is unclear that Other (Refugee) Immigrants had higher Drinking Belief Change Rate and greater Drinking Belief Change.

It is inferred that immigrants of different category sub-groups could have different level of drinking acculturation, which contributed difference of drinking change.

## **Significance Level**

Though significance analysis results show that there was no statistical significance difference between rates in Drinking Change in different immigrant sub-groups, there were greater or very great percentage differences between some of rates in Drinking Change.

## **Multivariate Analysis**

The results of correlation analysis show that Drinking Change (Drinking Behavior Change + Drinking Belief Change) was positively correlated with Mother Tongue and negatively correlated with Gender, and Drinking Behavior Change was negatively correlated with Gender and Category of Immigration. Gender was correlated with both Drinking Behavior Change and Drinking Belief Change. Category of Immigration was only correlated with Drinking Behavior Change instead of Drinking Belief Change. Mother Tongue was correlated with Drinking Belief Change, because it was not correlated with Drinking Behavior Change, which reveals that culture was correlated with Drinking Belief and Drinking Belief Change.

Meanwhile, the results of regression analysis disclose that Mother Tongue and Gender significantly impacted Drinking Change, and Gender significantly influenced Drinking Behavior Change. Gender significantly affected both Drinking Behavior Change and Drinking Belief Change, and was a main determinant of Drinking Change. A research finding reveals that gender was an important determinant of frequency, total number of drinks and volume of drinking (Marin 1995). Mother Tongue significantly impacted Drinking Belief Change, as it did not significantly influenced Drinking Behavior Change, and was a determinant of Drinking Belief Change, which exposed that significantly affected Drinking Belief and Drinking Belief Change.

Apparently, drinking behavior of immigrants could not happen change accordingly with their drinking belief. Some of immigrants changed drinking behavior, but did not change drinking belief. They experienced drinking behavior change because of other factors instead of drinking belief change. On the contrary, drinking belief change of some of immigrants could not bring directly the same drinking behavior change. Immigrants of different sub-groups could experience different belief changes because of difference of acceptability of new drinking belief. The immigrants with different linguistic, cultural or social backgrounds indicated different data regarding drinking belief change. Original culture and/or acculturation of immigrants were important impacting factors on their drinking behavior change and drinking belief change.

Believably, the results of this drinking change study provide evidence for making and/or revising policies related to immigrant health in Canada, which may regulate or adjust health care and service for immigrants, and make more effectively drinking health promotion program to lessen immigrant risk of

diseases relating to excessive drinking, and to reduce health inequality and inequity for immigrants. The data may help Health Canada policy makers to source and consider evidence of drinking change for the vulnerable and/or marginalized population in decision-making and policy-revising process, and to adapt appropriately evidence, prior to and during formulating new health policy or revising previous health policy. Thus, Canadian immigrants can improve their health to contribute Canadian economic and social development.

### **Conclusion**

The immigrants of different gender, language and category sub-groups in Canada showed a difference in their experience regarding alcohol consumption change or drinking change. Mother tongue and gender were main factors impacting drinking change, while gender was a principal factor influencing drinking behavior change. Drinking Behavior Change could not accord with Drinking Belief Change, and Drinking Behavior Change and Drinking Belief Change did not contribute identically Drinking Change. Culture and acculturation were relating factors contributing Drinking Behavior Change and Drinking Belief Change. Data of immigrant drinking change may provide evidence for drinking health policy-making and policy-revising in Canada.

### **Competing Interests**

The authors declare that they have no conflict of interests.

### **Acknowledgements**

The authors appreciate lingual support of the bilingual teachers, Claude Couture and Denis Mascotto in Centre de formation professionnelle Vision-Avenir, Commission scolaire des Portages-de-l'Outaouais, Gatineau, Québec, Canada. Particularly, the authors are very grateful to assistance of immigrant health expert, Dr. Brian Gushulak in Immigration Health Consultants in Canada.

### **Funding Statement**

The immigrant Alcohol Consumption or Drinking Change study was part of the principal researcher (correspondent author)'s DrPH (Doctor of Public Health) project (multicultural lifestyle change research project in Canada, which included Smoking Change, Drinking Change, Mood Change, Sleep Change, Physical Activity Change, Dietary Change and Health Status Change of English, French and Chinese

Speaking Immigrant in Ottawa and Gatineau, Canada). The research project was funded by the correspondent author.

### Reference

- Abraido-Lanza AF, Chao MT, Florez KR. Do healthy behaviors decline with greater acculturation? Implications for the Latino mortality paradox. *Soc Sci Med*, 2005 Sep., 61: 6 (1243-1255).  
<http://www.ncbi.nlm.nih.gov/pubmed/15970234?dopt=Abstract&holding=f1000.f1000m.isrctn> .
- Alaniz ML, Treno AJ and Saltz RF. Gender, Acculturation, and Alcohol Consumption among Mexican Americans. *Substance Use & Misuse*, 1999, 34: 10 (1407-1426).  
<http://informahealthcare.com/doi/abs/10.3109/10826089909029390?journalCode=sum> .
- Ali JS. (2002). Mental health of Canada's immigrants. Supplement to Health reports, Vol. 13, Statistics Canada, Catalogue No. 82-003. <http://www.statcan.gc.ca/pub/82-003-s/2002001/pdf/82-003-s2002006-eng.pdf> .
- Amundsen EJ. Low level of alcohol drinking among two generations of non-Western immigrants in Oslo: a multi-ethnic comparison. *BMC Public Health*, 2012 July, 12:535. doi: 10.1186/1471-2458-12-535.  
<http://www.biomedcentral.com/1471-2458/12/535> .
- Becerra MB, Herring P, Marshak HH and Banta JE. Association between Acculturation and Binge Drinking among Asian-Americans: Results from the California Health Interview Survey. *Journal of Addiction*, 2013, Volume 2013, 10 pages. <http://dx.doi.org/10.1155/2013/248196> or  
<http://www.hindawi.com/journals/jad/2013/248196/> .
- Caetano R. Alcohol use among Hispanic groups in the United States. *American Journal of Drug and Alcohol Abuse*, 1988, 14: 3 (293-308). <http://www.ncbi.nlm.nih.gov/pubmed/3189253> .
- Caetano R, Mora ME. Acculturation and drinking among people of Mexican descent in Mexico and the United States. *J Stud Alcohol*, 1988 Sep., 49: 5 (462-71). <http://www.ncbi.nlm.nih.gov/pubmed/3216651> .
- Caetano R, Clark C & Tam T. Alcohol Consumption Among Racial/Ethnic Minorities, *Alcohol Health and Research World*, 1998, 22: 4 (236-238). <http://pubs.niaaa.nih.gov/publications/arh22-4/233.pdf> .
- Caetano R, Ramisetty-Mikler S, Wallisch LS, Mcgrath C. Acculturation, Drinking, and Alcohol Abuse and Dependence Among Hispanics in the Texas-Mexico Border. *Alcoholism: Clinical and Experimental Research*, 2008 Feb., 32: 314-321. <http://onlinelibrary.wiley.com/doi/10.1111/j.1530-0277.2007.00576.x/abstract> .
- Caetano R, Ramisetty-Mikler S and Rodriguez LA. The Hispanic Americans Baseline Alcohol Survey (HABLAS): Rates and Predictors of Alcohol Abuse and Dependence Across Hispanic National Groups. *J*

Stud Alcohol Drugs, 2008 May, 69: 3 (441-448).

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2553043/> .

Cook WK, Mulia N, Karriker-Jaffe K. Ethnic Drinking Cultures and Alcohol Use among Asian American Adults: Findings from a National Survey. Alcohol and Alcoholism, 2012 Feb., DOI:

<http://dx.doi.org/10.1093/alcalc/ags017> 340-348. <http://alcalc.oxfordjournals.org/content/47/3/340> .

De La Rosa M, Dillon FR, Sastre F, Babino R. Alcohol Use among Recent Latino Immigrants Before and After Immigration to the United States. Am J Addict, 2013 Mar-Apr., 22(2): 10.1111/j.1521-

0391.2013.00310.x. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3845456/> .

Ekeberg OM, Bautz-Holter E, Tveitå EK, Keller A, Juel NG and Brox JI. Agreement, reliability and validity in 3 shoulder questionnaires in patients with rotator cuff disease. BMC Musculoskeletal Disorders 2008 May, 9:68. <http://www.biomedcentral.com/1471-2474/9/68> .

Eshaghi S-E, Ramezani MA, Shahsanaee A and Pooya A. Validity and Reliability of the Short Form- 36 Items Questionnaire as a Measure of Quality of Life in Elderly Iranian Population. American Journal of Applied Sciences, 2006, 3: 3 (1763-1766). <http://www.thescipub.com/pdf/10.3844/ajassp.2006.1763.1766> .

Galvan FH and Caetano R. Alcohol Use and Related Problems Among Ethnic Minorities in the United States. Alcohol Research and Health, 2003, 27: 1 (87-94). [http://www.ehd.org/health\\_alcohol\\_4.php](http://www.ehd.org/health_alcohol_4.php) , and <http://www.ncbi.nlm.nih.gov/pubmed/15301403> .

Grau E. Using Factor Analysis and Cronbach's Alpha to Ascertain Relationships Between Questions of a Dietary Behavior Questionnaire. Section on Survey Research Methods. Mathematica Policy Research, Princeton, NJ, USA. 2007, 3104 – 3110.

<http://www.amstat.org/sections/srms/proceedings/y2007/Files/JSM2007-000505.pdf> .

Guilamo-Ramos V, Jaccard J, Johansson M, Turrisi R. Binge drinking among Latino youth: role of acculturation-related variables. Psychol Addict Behav, 2004 Jun, 18: 2 (135-42).

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2928566/> .

Health Canada. Canadian Alcohol and Drug Use Monitoring Survey: Summary of Results for 2012. 2013 May. [http://hc-sc.gc.ca/hc-ps/drugs-drogues/stat/\\_2012/summary-sommaire-eng.php#s2](http://hc-sc.gc.ca/hc-ps/drugs-drogues/stat/_2012/summary-sommaire-eng.php#s2) and [http://hc-sc.gc.ca/hc-ps/drugs-drogues/stat/\\_2012/tables-tableaux-eng.php#t1](http://hc-sc.gc.ca/hc-ps/drugs-drogues/stat/_2012/tables-tableaux-eng.php#t1) .

Hopkins C, Fairley J, Yung M, Hore I, Galasubramaniam S, Haggard M. The 14-item Paediatric Throat Disorders Outcome Test: a valid, sensitive, reliable, parent-reported outcome measure for paediatric throat disorders. The Journal of Laryngology & Otology, 2010 Jan., 124, 306–314.

[http://journals.cambridge.org/download.php?file=%2FJLO%2FJLO124\\_03%2FS0022215109992386a.pdf&code=ea89a4dd63b9103cb1a15cd526574854](http://journals.cambridge.org/download.php?file=%2FJLO%2FJLO124_03%2FS0022215109992386a.pdf&code=ea89a4dd63b9103cb1a15cd526574854) .

- Kim SS. Recency of Immigration and Immigrant Alcohol and Tobacco Use. Department of Sociology, Arizona State University. 2005. PhD Research Paper. <http://paa2005.princeton.edu/papers/50113> .
- Kunz JL. Cultural Diversity: Lifestyle differences between immigrant and Canadian-born youth. ACCSD research program, Canadian Council on Social Development, 1999, 23: 3. <http://www.ccsd.ca/subsites/cd/docs/insite/insite.htm> .
- LaFromboise T, Coleman HL, Gerton J. Psychological impact of biculturalism: evidence and theory. Psychol Bull. 1993 Nov., 114:3 (395-412). <http://www.ncbi.nlm.nih.gov/pubmed/8272463/> .
- Lo CC and Globetti G. Chinese in the United States: An Extension of Moderation in Drinking. International Journal of Comparative Sociology, 2001, 42: 3 (261-274). <http://booksandjournals.brillonline.com/content/journals/10.1163/156851801317046194?crawler=true> .
- Lu C, Sylvestre J, MelnychuckN, Li J. East meets West: Chinese-Canadians perspectives on health and fitness. Canadian Journal of Public Health, 2008 Jan-Feb., 99: 1 (22-25). <http://www.ncbi.nlm.nih.gov/pubmed/18435385> .
- Mainous AG, Duaz VA, Geesey ME. Acculturation and Healthy Lifestyle Among Latinos With Diabetes. Annals of Family Medicine, 2008 March, 6: 2 (131-137). <http://www.annfammed.org/content/6/2/131.abstract> .
- Makimoto K. Drinking Patterns and Drinking Problems Among Asian-Americans and Pacific Islanders. Alcohol Health and Research World, 1998 Feb., 22: 4 (270-5). [http://www.researchgate.net/publication/8025847\\_Drinking\\_patterns\\_and\\_drinking\\_problems\\_among\\_Asi-an-Americans\\_and\\_Pacific\\_Islanders](http://www.researchgate.net/publication/8025847_Drinking_patterns_and_drinking_problems_among_Asi-an-Americans_and_Pacific_Islanders) .
- Man G. Gender, work and migration: Deskillling Chinese immigrant women in Canada. Women's Studies International Forum, 2004 June–July, 27: 2 (135-148). <http://www.sciencedirect.com/science/article/pii/S0277539504000172> .
- Marin G, Posner SF. The role of gender and acculturation on determining the consumption of alcoholic beverages among Mexican-Americans and Central Americans in the United States. Int J Addict., 1995 May, 30: 7 (779-94). <http://www.ncbi.nlm.nih.gov/pubmed/7558470/> .
- McDonald JT, Kennedy S. Is migration to Canada associated with unhealthy weight gain? Overweight and obesity among Canada's immigrants. Social Science & Medicine, 2005, 61: 12 (2469-2481). <http://www.rdc-cdr.ca/migration-canada-associated-unhealthy-weight-gain-overweight-and-obesity-among-canadas-immigrants> .

- McDonald JT. The Health Behaviours of Immigrants and Native-Born People in Canada. The Atlantic Metropolis Centre's Working Papers Series. 2006. Working Paper No. 01-06.  
<http://community.smu.ca/atlantic/documents/McDonald-WP1.pdf> .
- Mills BA and Caetano R. Decomposing Associations Between Acculturation and Drinking in Mexican Americans. *Alcoholism: Clinical and Experimental Research*, 2012 July, 36: 7 (1205-1211).  
<http://onlinelibrary.wiley.com/doi/10.1111/j.1530-0277.2011.01712.x/abstract> .
- Mulira JE. Ugandans in Canada: A Life Experience. Xlibris Corporation. 2010. ISBN: Ebook: 978-1-4535-8513-9. <http://www.bookwire.com/book/Ugandans-in-Canada-9781453585139-Mulira-J-E-34196772> .
- Parikh NS, Fahs MC, Shelley D, Yerneni R. Health behaviors of older Chinese adults living in New York City. *Journal of Community Health*, 2009 Feb., 34: 1 (6-15).  
<http://www.ncbi.nlm.nih.gov/pubmed/18830807> .
- Pedersen ER, Cruz RA, LaBrie JW & Hummer JF. Examining the Relationships Between Acculturation Orientations, Perceived and Actual Norms, and Drinking Behaviors of Short-Term American Sojourners in Foreign Environments. *Prevention Science*, 2011, 12: 4 (401-10). DOI 10.1007/s11121-011-0232-7.  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3577352/> .
- Pérez CE. Health Status and Health Behaviour Among Immigrants. Statistics Canada, Catalogue 82-003. Supplement to Health Reports, volume 13, 2002. <http://www.statcan.gc.ca/pub/82-003-s/2002001/pdf/82-003-s2002005-eng.pdf> .
- Pérez-Escamilla R and Putnik P. The Role of Acculturation in Nutrition, Lifestyle, and Incidence of Type 2 Diabetes among Latinos. *J. Nutr.*, 2007 April, 137: 4 (860-870).  
<http://jn.nutrition.org/content/137/4/860.full> .
- Research Methods Knowledge Base (RMKB). 2006, Oct. Nonprobability Sampling.  
<http://www.socialresearchmethods.net/kb/sampnon.php> .
- Roy J-O, Belkhdja C, Gallant N. 2007 Oct. Nos diverses cites: Immigration francophone en milieu minoritaire : le défi de la ruralité. Université Concordia, Canada.  
[http://nre.concordia.ca/\\_ftp2004/featured\\_publication/ODC\\_Summer07\\_3\\_fr.pdf#page=89](http://nre.concordia.ca/_ftp2004/featured_publication/ODC_Summer07_3_fr.pdf#page=89) .
- Statistics Canada (SC). The Daily: Health status of Canada's immigrants. 2002 Sep.  
<http://www.statcan.gc.ca/daily-quotidien/020919/dq020919a-eng.htm> .
- Statistics Canada (SC). Immigration in Canada: A Portrait of the Foreign-born Population, 2006 Census: Portraits of major metropolitan centres: Ottawa - Gatineau: Fifth-largest proportion of foreign-born. 2009a Nov. <http://www12.statcan.ca/census-recensement/2006/as-sa/97-557/p23-eng.cfm> .
- Statistics Canada (SC). Survey Methods and Practices. 2010 (Originally published in October 2003). Catalogue no. 12-587-X. <http://www.statcan.gc.ca/pub/12-587-x/12-587-x2003001-eng.pdf> .



Statistics Canada (SC-census). Population by mother tongue, by census metropolitan area, excluding institutional residents, 2006 census metropolitan area. 2011 Census of Population and Statistics Canada catalogue no. [98-314-XCB](#).

<http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/demo12c-eng.htm> .

Su LJ, Nguyen SV, Nguyen LT, Hinh P, Lin H-Y, Legardeur B and Scribner R. Level of Acculturation and Lifestyle Changes in a Vietnamese American Population. The 130<sup>th</sup> Annual Meeting of American Public Health Association, 2002 November 11.

[https://apha.confex.com/apha/130am/techprogram/paper\\_45928.htm](https://apha.confex.com/apha/130am/techprogram/paper_45928.htm) .

Vaeth PAC, Caetano R, Rodriguez LA. The Hispanic Americans Baseline Alcohol Survey (HABLAS): The association between acculturation, birthplace and alcohol consumption across Hispanic national groups. *Addict Behav*, 2012 April, 37: 9 (1029-1037). <http://europepmc.org/articles/PMC3795416> .

Verney SP. Acculturation and Alcohol Treatment in Ethnic Minority Populations: Assessment Issues and Implications. *Alcoholism Treatment Quarterly*, 2007 Nov., 25: 4 (47-61). DOI: 10.1300/J020v25n04\_04. [http://www.researchgate.net/publication/247495626\\_Acculturation\\_and\\_Alcohol\\_Treatment\\_in\\_Ethnic\\_Minority\\_Populations\\_Assessment\\_Issues\\_and\\_Implications](http://www.researchgate.net/publication/247495626_Acculturation_and_Alcohol_Treatment_in_Ethnic_Minority_Populations_Assessment_Issues_and_Implications) .

Zemore SE. Re-examining whether and why acculturation relates to drinking outcomes in a rigorous, national survey of Latinos. *Alcohol Clin Exp Res*, 2005 Dec, 29: 12 (2144-53).

<http://www.ncbi.nlm.nih.gov/pubmed/16385184> .