

RESEARCH COMMUNICATION

Hepatitis B Testing and Vaccination in Immigrants Attending English as a Second Language Classes in British Columbia, Canada

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Abstract

Background: Hepatitis B virus (HBV) is a growing health issue in Canada, especially given that population growth is now largely the result of immigration. Immigrants from countries with high HBV prevalence and low levels of HBV vaccination have an excess risk of liver disease and there is a need for increased diligence in HBV blood testing and possibly vaccination among these populations. **Objective:** This study describes the sociodemographic characteristics associated with a history of HBV testing and HBV vaccination in immigrants from several countries with high HBV prevalence who are attending English classes. **Methods:** 759 adult immigrants attending English as a Second Language classes completed a self-administered questionnaire asking about sociodemographic characteristics and history of HBV testing and HBV vaccination. Descriptive statistics and adjusted ORs were calculated to explore these associations. **Results:** 71% reported prior HBV testing, 8% reported vaccination without testing, and 21% reported neither testing nor vaccination. Age, education and country of birth all showed significant effects for both testing and vaccination. **Conclusions:** Health care practitioners need to be cognizant of HBV testing, and possibly vaccination, in some of their patients, including immigrants from countries with endemic HBV infection. Infected persons need to be identified by blood testing in order receive necessary care to prevent or delay the onset of liver disease as well as to adopt appropriate behaviours to reduce the risk of transmission to others. Close contacts of infected persons also require HBV testing and subsequent vaccination (if not infected) or medical management (if infected).

Key Words: Hepatitis B - diagnosis - primary prevention - immigrants

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Introduction

Hepatitis B virus (HBV) infection is highly endemic in most Asian countries (Nguyen and Keeffe, 2003) and between 30% and 50% of Chinese immigrants to North America show serologic evidence of past HBV infection (Walker and Jaranson, 1999; Merican et al., 2000). In 2004, approximately 250,000 persons in Canada were infected with HBV, 70% being immigrants (Sherman et al., 2004). Immigrants from countries with high HBV prevalence and low levels of HBV vaccination have an excess risk of liver disease (Di Bisceglie et al., 1988; Hwang et al., 1996; London and McGlynn, 1996; Euler, 1997; Merican et al., 2000; Jenkins et al., 2001). In fact, 80% of liver cancer among Asians in the United States (US) was associated with HBV infection (London and McGlynn, 1996; Johnson, 1996).

Approximately one-third of HBV-infected Asian-born persons in the US are unaware of their infection: this information is lacking in Canada and other countries (Weinbaum et al., 2008). It is very important that these infected persons are identified by blood testing in order to receive necessary care to prevent or delay the onset of liver disease as well as to adopt appropriate behaviours to reduce the risk of transmission to others. Close contacts of infected persons also require HBV testing and subsequent vaccination (if not infected) or medical management (if infected) (Weinbaum et al., 2008).

HBV infection is a growing health issue in Canada, especially given that population growth is now largely the result of immigration. Many immigrants are coming from countries where HBV infection is highly endemic and liver cancer is a serious health concern (Weinbaum et al., 2008). There is need for health education among

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immigrants based on a thorough understanding of their HBV-related knowledge, beliefs and practices (Hubbell et al., 1995). However, reports on HBV-related knowledge and behaviour in Asian immigrants are few and have been limited to Chinese (Thompson et al., 2002; Thompson et al., 2003; Taylor et al., 2006; Coronado et al., 2007; Hislop et al., 2007), Koreans (Choe et al., 2005), Vietnamese (Taylor et al. 2004; Burke et al., 2004; Taylor et al., 2005) and Cambodians (Taylor et al., 2002), mostly in the US.

One approach for reaching recent immigrants with health messages is through classes offering English as a second language (ESL) instruction. We are conducting a randomized trial of an HBV educational ESL curriculum for immigrant students in the Greater Vancouver area (Taylor et al., 2008; Taylor et al., in press). This paper presents the findings from the trial's baseline survey on relationships between sociodemographic characteristics and history of HBV testing and HBV vaccination, in students from selected countries with high HBV prevalence (including China, India, Iran, Afghanistan and Korea), several of which have very little information.

Materials and Methods

We studied a group of adult immigrants to the Greater Vancouver area who were attending ESL classes offered through the "English Language Services for Adults" (ELSA) program between June 2006 and January 2009. Collaboration was obtained from six community-based organizations providing ELSA classes to recent immigrants: Burnaby Continuing Education, the Immigrant Services Society of British Columbia, MOSAIC, Richmond Continuing Education, S.U.C.C.E.S.S., and Progressive Intercultural Community Services Society.

ELSA offers level 1 (low beginner) through level 5 (high intermediate) classes. Eligible students were from 80 level 3 (low intermediate) classes which focus on intermediate life skills; thus they exclude people with very low English proficiency who would not be able to understand health information and advanced students who are usually more acculturated and trying to perfect their English proficiency. Given the ethnic mix of the classes and need to provide study materials in the student's mother tongue, we restricted eligibility to those who spoke Mandarin, Cantonese, Punjabi, Farsi or Korean. The study was approved by the Research Ethics Board at the University of British Columbia.

Data were collected by a self-administered questionnaire which included questions on gender, age, years of education, country of birth and immigration year. The following question was also asked about HBV testing and vaccination history: "Hepatitis is an inflammation of the liver caused by a viral infection. It sometimes makes the skin and eyes go yellow. People with hepatitis sometimes lose their appetite and experience nausea as well as vomiting. Have you ever had a blood test to see if you have been exposed to hepatitis B? Have you ever had vaccinations to prevent you from getting hepatitis B?" The questionnaire was offered in the language of choice: Mandarin, Cantonese, Punjabi, Farsi or Korean.

Completed questionnaires were then gathered and reviewed by two trained researchers (CT, WL) while the class was in session and any ambiguous or missing responses were clarified with the student before the end of the class.

For each sociodemographic characteristic, we calculated the proportions of students who had been tested, and vaccinated, for HBV. For each variable, we used a chi-square test to assess whether there was a difference in these proportions between categories.

For the analyses of both HBV testing and vaccination, we chose one category of each variable as the reference and estimated odds ratios (ORs) for the remaining categories. Each OR estimate was calculated using a logistic regression model with categorized variables for participant's gender, age, years of education, country of birth and year of immigration. Thus all OR estimates are adjusted for the other variables listed. The OR is a ratio of the odds for a student in that category of having had the testing/vaccination compared to the same odds for students in the reference category. A 95% confidence interval (CI) was calculated for each OR using the same model. This analysis was restricted to the 752 respondents with complete information for all variables.

Finally, we considered the proportion of students who received each possible combination of HBV testing and vaccination and examined the distribution of sociodemographic characteristics for students who were vaccinated but not tested.

Results

A total of 759 of 848 eligible students (90%) completed the self-administered questionnaire. Response

Table 1. Participants with Reference to Sociodemographic Characteristics, n=759

Variable	Total	Tested		Vaccinated		
		No (%)	p-value	No. (%)	p-value	
Gender	Male	215	147 (68)	0.31	97 (45)	0.04
	Female	544	394 (72)		292 (54)	
Age (years)	<30	116	60 (52)	<0.001	54 (47)	<0.001
	30-39	224	179 (80)		126 (56)	
	40-49	318	236 (74)		177 (56)	
	≥50	94	62 (66)		62 (31)	
Years of education	≤12	179	103 (58)	<0.001	73 (41)	<0.001
	13-15	274	201 (73)		136 (50)	
	≥16	306	237 (77)		180 (59)	
Country of birth	Afghanistan	22	8 (36)	<0.001	7 (32)	<0.001
	China	462	354 (77)		257 (56)	
	India	47	9 (19)		13 (28)	
	Iran	79	48 (61)		39 (49)	
	Korea	64	57 (89)		44 (69)	
	Taiwan	68	53 (78)		24 (35)	
	Other*	17	12 (71)		5 (29)	
	Immigration year					
2002 or earlier	72	42 (58)	0.04	26 (36)	0.02	
2003-2004	157	111 (71)		91 (58)		
2005-2006	376	270 (72)		194 (52)		
2007 or later	153	118 (77)		78 (51)		

*Hong Kong, Malaysia, Singapore, and Vietnam; Missing values: age in years (7), immigration year (1), all others (0)

rates varied by ethnic group, being 99%, 91%, 90%, 85% and 80% for Cantonese, Farsi, Mandarin, Punjabi and Korean speakers, respectively. Respondents were mainly female (72%), age 30-49 years (72%), with post secondary education (76%), from China (61%), and recently immigrated (70% since 2005).

A total of 541 (71%) respondents reported previous HBV testing: with 332 (44%) receiving both testing and vaccination, and 209 (28%) receiving testing but no vaccination. Of concern, 57 (8%) respondents reported having been vaccinated without prior testing and 161 (21%) respondents reported having received neither testing nor vaccination.

Hepatitis B testing

The proportions and ORs for previous HBV testing are shown by sociodemographic characteristic in Table 1 and Figure 1, respectively. Age, education and country of

birth all showed highly significant effects. Testing was lowest under age 30 years and highest at age 30-39 years, decreasing thereafter with advancing age. Testing increased with higher education and showed wide differences by country of birth, being lowest in India and Afghanistan and highest in Korea, Taiwan and China. The effect of immigration year was marginally significant, with greater testing in recent immigrants. There was no significant gender difference.

Hepatitis B vaccination

The proportions and ORs for HBV vaccination are shown by sociodemographic characteristic in Table 1 and Figure 2, respectively. As for HBV testing, age, education and country of birth showed highly significant effects. Vaccination was most common at age 30-49 years and least common over age 50 years. Vaccination increased with advancing education and showed wide differences

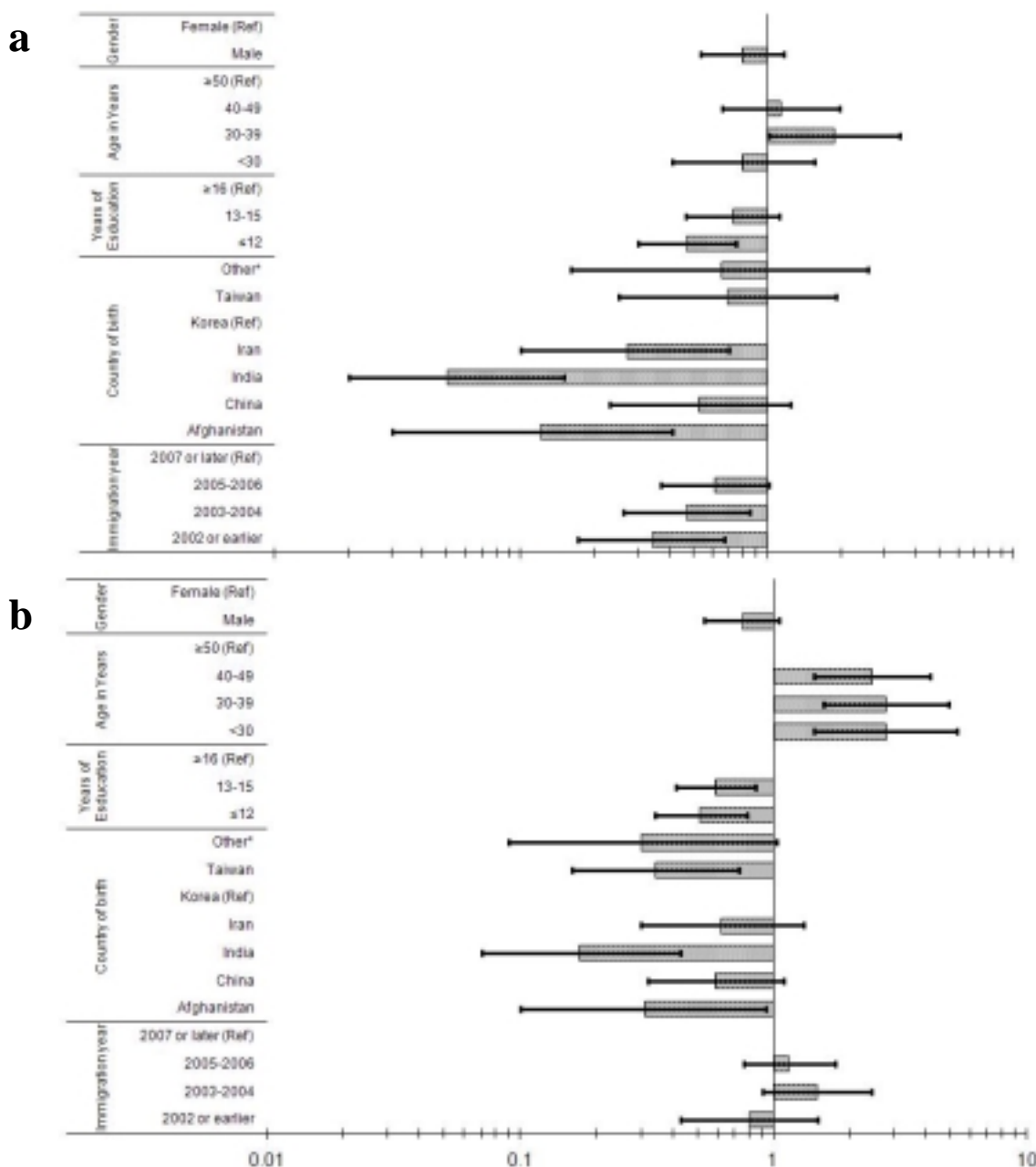


Figure 1. Adjusted Odds Ratios with Reference to Sociodemographic Characteristics, n=752. a) Hepatitis B Testing b) Hepatitis B Vaccination

Table 2. Participants Reporting having Received Hepatitis B Vaccination without Prior Testing with Reference to Sociodemographic Characteristics

Variable	Total	No (%)	p-value	
Gender	Male	215	17 (8)	0.76
	Female	544	40 (7)	
Age in years	<30	116	13 (11)	0.14
	30-39	224	10 (4)	
	40-49	318	26 (8)	
	≥50	94	7 (7)	
Years of education	≤12	179	18 (10)	0.13
	13-15	274	14 (5)	
	≥16	306	25 (8)	
Country of birth	Afghanistan	22	1 (5)	0.07
	China	462	33 (7)	
	India	47	6 (13)	
	Iran	79	11 (14)	
	Korea	64	3 (5)	
	Taiwan	68	1 (1)	
	Other*	17	2 (12)	
	Immigration year			
2002 or earlier	72	7 (10)	0.34	
2003-2004	157	15 (10)		
2005-2006	376	28 (7)		
2007 or later	153	7 (5)		

*Hong Kong, Malaysia, Singapore, and Vietnam; Missing values: age in years (7), immigration year (1), all others (0)

by country of birth, being especially low in India and Afghanistan, and high in Korea, China and Iran. Immigration year was significant, with less vaccination for immigration prior to 2003. The effect of gender was of marginally significant, with greater vaccination in females.

Vaccination without prior hepatitis B testing

The proportions reporting HBV vaccination without prior testing are shown by sociodemographic characteristics in Table 2. Although the numbers were too small for interpretation, this was most frequent under age 30 years and in those with less education. Again, there were wide differences by country of birth, being highest in Iran and India and lowest in Taiwan, Korea and Afghanistan. It also became less common in recent years, dropping from 10% prior to 2005 to 5% after 2006. The numbers were too small to conduct further analysis to calculate adjusted ORs.

Discussion

A small number of studies have reported on the prevalence of HBV infection in the general Canadian population, with substantial variation due to heterogeneity in the Canadian population (Minuk and Uhanova, 2001; Wu et al., 2005). HBV prevalence has been high in immigrant populations and Inuit, intermediate among First Nations, and low in the general population (Zhang et al., 2001). Increased immigration from high and intermediate endemic areas and integration of these immigrants with the general population will directly influence the growth in prevalence of HBV in the future (Zuckerman et al.,

2007).

Nearly 30% of our study group reported never being tested for HBV, although their birth countries had high rates of infection. Highest testing was reported by students from Korea, Taiwan and China. Encouragingly, HBV testing was more common than reported in earlier North American studies of Chinese adults which included North American-born and long term immigrants (Thompson et al., 2002; Taylor et al., 2006; Hislop et al., 2007). This suggests improvement in testing in recent years in some Asian countries with recent immigrants being tested in their birth country rather than in Canada. The lack of gender differences is surprising because women are often tested as part of their prenatal care. We found similar results in an earlier community-based survey of Chinese men and women in Vancouver (Hislop et al., 2007).

Of those tested, a majority reported receiving HBV vaccination. Similar sociodemographic characteristics were associated with vaccination as with testing. Interestingly, persons from Taiwan reported low vaccination rates despite this country having implemented a population-based HBV vaccination program for over 20 years, targeting infants and children (Hsu et al., 1999; Farrell and Liaw, 2000). In China, there has been a steady increase in vaccination in infants and a decrease in chronic HBV carrier rate in both children and the general population since the addition of vaccination of infants and high risk persons to the National Immunization Program in 1992 and the provision of vaccination at no cost since 2005 (Chinese Society of Hepatology et al., 2005; Zhou et al., 2008). The decrease in prevalence of chronic HBV infection in vaccinated foreign-born immigrants is most likely due to infant immunization programs globally (Weinbaum et al., 2008).

Of concern, however, nearly 10% of students reported receiving HBV vaccination without prior testing. These persons may be chronic carriers, placing others at risk of infection and themselves at risk of developing liver disease and cancer. In addition, over 20% of students reported not receiving either testing or vaccination; some may be chronic carriers. Better identification and management of chronic carriers may help prevent the serious sequelae of chronic liver disease and contribute to improved strategies to eliminate HBV transmission to others (Weinbaum et al., 2008).

Our study has several strengths. We recruited students from countries with endemic HBV infection which included leading countries of immigration into Canada; we included immigrants from Afghanistan, India, and Iran (we are unaware of any previous reports on immigrants from these countries); we approached students from several service agencies offering ESL instruction to recent immigrants; we offered the questionnaire in the student's mother tongue; and we obtained excellent response rates.

Our study also has several limitations. Respondents were recruited from ESL classes and do not represent all recent immigrants. However, the 2001 Canadian census reported that only 18% of immigrants to Canada spoke English or French as their mother tongue (Schellenberg and Maheux, 2007). English proficiency is largely related to exposure to English language before coming to Canada:

in the 1990's, only about 20%, 25%, 40% and 45% of Punjabi, Korean, Mandarin and Cantonese speakers reported English proficiency (BC Stats, 2009). More recently, in a national survey between 2002 and 2005, 26% of new Canadian immigrants reported taking at least one official language course and a further 12% looked for information regarding language training (Schellenberg and Maheux, 2007).

Other limitations include the differential response rate by mother tongue which may affect the reported testing and vaccination rates (e.g., higher testing rate among Koreans may partly be a function of their lower response rate); recruitment of only Mandarin, Cantonese, Punjabi, Farsi and Korean speakers; and the use of self-reported data, with possible confusion regarding the purpose of prior blood testing which may lead to overestimation of screening rates.

Clearly, there is a need for health care practitioners to be cognizant of the need for HBV testing, and possibly vaccination, in some of their patients, including immigrants from countries with endemic HBV infection. Given the changing demographics of the Canadian population and the increasing immigration from countries highly endemic with HBV and no established vaccination program (such as India) HBV infection and liver cancer control will remain significant health concerns in Canada. Careful clinical monitoring and management of persons with chronic HBV infection (Weinbaum et al., 2008) and continued epidemiologic surveillance (Kim, 2009) remain important.

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References

BC Stats (2009). Special feature: Mother tongue of recent immigrants to British Columbia. Immigration Highlights, issue 00-3. Available from: <http://www.bcstats.gov.bc.ca/pubs/immig/imm963s1.pdf>. Accessed August 29, 2009.

Burke NJ, Jackson JC, Thai HC, et al (2004). 'Honoring tradition, accepting new ways': Development of a hepatitis B control intervention for Vietnamese immigrants. *Ethn Health*, **9**, 153-69.

Chinese Society of Hepatology, Chinese Medical Association and Chinese Society of Infectious Diseases, Chinese Medical Association (2007). Guideline on prevention and treatment of chronic hepatitis B in China (2005). *Chin Med J*, **120**, 2159-73.

Choe JH, Chan N, Do HH, et al (2005). Hepatitis B and liver cancer beliefs among Korean immigrants in Western Washington. *Cancer*, **104**, 2955-8.

Coronado GD, Taylor VM, Tu SP, et al (2007). Correlates of hepatitis B testing among Chinese Americans. *J Community Health*, **32**, 379-90.

Di Bisceglie AM, Rustgi UK, Hoofnagle JH, Dusheiko GM, Lotze MT (1988). NIH conference: Hepatocellular carcinoma. *Ann Intern Med*, **108**, 390-401.

Euler GL (1997). Asian and Pacific Islander child hepatitis B vaccination catch-up: Why now is the best time. *Asian Am Pacific Isl J Health*, **5**, 40-5.

Farrell GC, Liaw YF (2000). Towards consensus on the control of chronic hepatitis B and hepatitis C in the Asia-Pacific region. *J Gastroenterol Hepatol*, **15**, 1-2.

Hislop TG, Teh C, Low A, et al (2007). Predisposing, reinforcing and enabling factors associated with hepatitis B testing in Chinese Canadians in British Columbia. *Asian Pacific J Cancer Prev*, **8**, 39-44.

Hsu HM, Lu CF, Lee SC, Lin SR, Chen DS (1999). Seroepidemiologic survey for hepatitis B infection in Taiwan: the effect of hepatitis B mass immunization. *J Infect Dis*, **179**, 367-70.

Hubbell FA, Chavez LR, Mishra SI, Magana JR, Burciaga Valdez R (1995). From ethnography to intervention: Developing a breast cancer control program for Latinas. *Natl Cancer Inst Monogr*, **18**, 109-115.

Hwang SJ, Tong MJ, Lai PPC, et al (1996). Evaluation of hepatitis B and C viral markers: Clinical significance in Asian and Caucasian patients with hepatocellular carcinoma in the United States of America. *J Gastro Hep*, **11**, 949-54.

Jenkins CNH, Buu C, Berger W, Son DT (2001). Liver carcinoma prevention among Asian Pacific Islanders. *Cancer*, **91**, 252-256.

Johnson PJ (1996). The epidemiology of hepatocellular carcinoma. *Eur J Gastroenterol Hepatol*, **8**, 845-9.

Kim WR (2009). Epidemiology of hepatitis B in the United States. *Hepatol*, **49**, S28-34.

London WT, McGlynn KA (1996). Liver cancer. In: Scottenfeld D, Fraumeni JF (Eds.), *Cancer Epidemiology and Prevention*. New York, NY: Oxford University Press.

Merican I, Guan R, Amarapuka D, et al (2000). Chronic hepatitis B virus infection in Asian countries. *J Gastroenterol Hepatol*, **15**, 1356-61.

Minuk GY, Uhanova J (2001). Chronic hepatitis B infection in Canada. *Can J Infect Dis*, **12**, 351-6.

Nguyen MH, Keeffe EB (2003). Chronic hepatitis B and hepatitis C in Asian Americans. *Rev Gastroenterol Dis*, **3**, 125-34.

Schellenberg G, Maheux H (2007). Immigrants' perspectives on their first four years in Canada: highlights from three waves of the longitudinal survey of immigrants to Canada. Canadian Social Trends, Special Edition 2007. Ottawa, ON: Statistics Canada. Available from: http://dsp-psd.pwgsc.gc.ca/collection_2007/statcan/11-008-X/11-008-XIE20070009627.pdf. Accessed 2009 August 29.

Sherman M, Vain V, Villeneuve JP, et al (2004). The management of chronic viral hepatitis: A Canadian Consensus Conference 2004. *Can J Gastroenterol*, **18**, 715-28.

Taylor VM, Tu SP, Woodall E, et al (2006). Hepatitis B knowledge and practices among Chinese immigrants to the United States. *Asian Pac J Cancer Prev*, **7**, 313-7.

Taylor VM, Yasui Y, Burke N, et al (2004). Hepatitis B testing among Vietnamese American men. *Cancer Detect Prev*, **28**, 107-7.

Taylor VM, Yasui Y, Burke N, et al (2005). Hepatitis B knowledge and testing among Vietnamese-American women. *Ethn Dis*, **15**, 761-7.

Taylor VM, Jackson JC, Chan N, Kuniyuki A, Yasui Y (2002). Hepatitis B knowledge and practices among Cambodian American women in Seattle, Washington. *J Community Health*, **27**, 151-63.

- Taylor VM, Coronado G, Acorda E, et al (2008). Development of an ESL curriculum to educate Chinese immigrants about hepatitis B. *J Community Health*, **33**, 217-24.
- Taylor VM, Teh C, Lam W, et al (in press). Evaluation of a hepatitis B educational ESL curriculum for Chinese immigrants. *Can J Public Health*.
- Thompson MJ, Taylor VM, Jackson JC, et al (2002). Hepatitis B knowledge and practices among Chinese American women in Seattle, Washington. *J Cancer Educ*, **17**, 222-6.
- Thompson MJ, Taylor VM, Yasui Y, et al (2003). Hepatitis B knowledge and practices among Chinese Canadian women in Vancouver, British Columbia. *Can J Public Health*, **94**, 281-6.
- Walker PF, Jaranson J (1999). Refugee and immigrant health care. *Med Clin North Am*, **83**, 1103-20.
- Weinbaum CM, Williams I, Mast EE, et al (2008). Recommendations for identification and public health management of persons with chronic hepatitis B virus infection. *MMWR*, **57**, 1-20.
- Wu HX, Andonov A, Giulivi A, et al (2005). Enhanced surveillance for childhood hepatitis B virus infection in Canada, 1999-2003. *Int J Med Sci*, **2**, 143-6.
- Zhang J, Zou S, Giulivi A (2001). Hepatitis B in Canada. Viral hepatitis and emerging bloodborne pathogens in Canada. Canada Communicable Disease Report Vol 27S. Available from: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/01vol27/27s3/27s3e_e.html. Accessed 2009 September 26.
- Zhou YH, WU C, Zhuang H (2008). Vaccination against hepatitis B: The Chinese experience. *Chin Med J*, **121**, 98-102.
- Zuckerman J, van Hattum J, Cafferkey M, et al (2007). Should hepatitis B vaccination be introduced into childhood immunisation programmes in northern Europe? *Lancet Infect Dis*, **7**, 410-9.