

KNOWLEDGE OF THE EFFECTS OF GESTATIONAL ALCOHOL COMSUMPTION AND
FASD IN AN ONTARIAN SAMPLE

by

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Abstract

The current document is a two-paper manuscript-based thesis investigating what women in Ontario know about drinking during the gestational period. Though there have been many studies investigating what women in various countries and locations know about drinking during pregnancy, there is a lack of recent data focusing on Ontario, Canada. Both papers use a survey-based approach to answer the research questions posed in each respective manuscript. The first paper explored what women currently know about drinking during pregnancy and what individual characteristics may influence endorsement of drinking behaviours. The majority of participants did not endorse drinking behaviours, however, a small but substantial portion of the population still endorses drinking. The second manuscript addressed where individuals receive their information about drinking during the gestational period. Results indicated that women in Ontario saw information in print and news media, but would most prefer to get their information from health care professionals. Implications in terms of education and prevention are discussed.

Keywords: Fetal Alcohol Spectrum Disorder, women's health, maternal health, alcohol, prenatal alcohol consumption, knowledge, media, misinformation

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Chapter 1: Introduction

Fetal Alcohol Spectrum Disorder (FASD) is a serious health concern, public health issue, and social problem among the Canadian population (Chudley et al., 2005; Popova, Lange, Burd, & Rehm; 2015; Popova, Lange, Probst, Gmel, Rehm, 2017). Due in part to the successful framing of the issue, Canada has become a leader in the prevention and public health response to alcohol consumption during the gestational period (Poole, 2010). As Canada is quite focused on FASD prevention, there have been a number of studies that have addressed the issue (Enviro-nics Research Group Limited, 2000; Lange, Probst, Quere, Rehm, & Popova, 2015; Lange, Quere, Shield, Rehm, & Popova, 2015; McDonald, Hicks, Rasmussen, Naguelsapillai, Cook, & Tough, 2014; Walker, Al-Sahab, Islam, & Tamim, 2011). Despite the abundance of Canadian research available, there is currently a paucity of current research related to what women know about drinking during pregnancy and where individuals receive their information.

Clear, supportive public health messaging is imperative to assure the health of Canadian women and to prevent FASD (Poole, 2010; Poole & Greaves, 2013) and, in order to provide these clear messages, public health professionals need a clear picture of what women currently know and where gaps exist. If current information can be effectively disseminated to many women's health stakeholders such as medical professionals and social service providers, public health campaigns can most effectively operate and hope to further reduce rates of FASD and to improve women's health (Poole & Greaves, 2013). Current information is of the utmost importance as recent misinformation and misinterpretation of the facts propagated by the media has muddied the waters and created more challenges for individuals who work in FASD prevention (Poole & Greaves, 2013).

Fetal Alcohol Spectrum Disorder

Throughout history, ranging from ancient Greek and Roman mythology to present day, there have been reports of the effects of maternal alcohol consumption on the developing fetus (Banakar, Kudlur, & George, 2009). Fetal alcohol syndrome was first formally described by Jones and Smith in 1973, giving a name to the constellation of symptoms that have been observed throughout history. FASD was used as an umbrella term to describe the range of effects on the fetus that may occur when a pregnant woman drinks during the gestational period (Astley & Clarren, 2000; Chudley et al., 2005). The umbrella of FASD encompassed a wide range of disorders caused by consumption of alcohol during the gestational period including Fetal Alcohol Syndrome (FAS), partial FAS (pFAS), Fetal Alcohol Effects (FAE), Alcohol-Related Neurodevelopmental disorder (ARND), and alcohol related birth defects (ARBD; Fuchs, Burnside, Marchenski, & Mundry, 2010).

In 2015, the Canadian diagnostic guidelines were updated to better reflect the disorder and the diagnostic process in Canada (Cook et al., 2015). In the new guidelines, FASD became the medical diagnostic term rather than simply an umbrella term for a myriad of different disorders. In addition to several criteria for diagnosis being changed, a new “at risk” category was also added as a possible diagnosis (Cook et al., 2015). The creation of this new “at risk” category means that there does not need to be a confirmation of alcohol exposure during gestation before treatment and services can be provided. As it is extremely difficult to ascertain whether a woman has consumed alcohol during the gestational period—birth mothers may no longer be in the child’s life and maternal self-reports can be unreliable—this new category will allow clinicians to identify and begin service delivery for children who would have otherwise

been missed under the old diagnostic criteria (Benz, Rasmussen, & Andrew, 2009; Cook et al., 2015).

FASD is a lifelong disorder, meaning that the disabilities start in childhood or are present at birth and persist well into adulthood (Brown, 2015; Temple, Ives, & Lindsay, 2015). Individuals with FASD experience common symptoms such as facial anomalies, skeletal deformities, speech and language deficits, motor dysfunctions, lifelong learning and behavioural difficulties, as well as sleeping and eating irregularities (Chudley et al., 2005; Cook et al., 2015; Walker, Fisher, Sherman, Wybrecht, & Kyndely, 2005). The classic FAS related facial abnormalities include a smooth philtrum or a thin vermilion border, impaired prenatal or postnatal growth, and central nervous system or nervous system disorders (Astley & Clarren, 2000; Chudley et al., 2005). Identification is preferable during childhood as earlier identification leads to early service provision, but a diagnosis at any stage of development may aid an individual in coping with many of the primary and secondary disabilities that are present in cases of FASD (Temple et al., 2015). For children who are the most severely affected by FASD, there is a potential for a diagnosis at birth, but the majority of cases are not diagnosed at birth and are often diagnosed between eight months and eight years of age when the physical characteristics of FASD are most pronounced (de Sanctis, Memo, Pichini, Tarani, & Vagnarelli, 2011). Diagnosis in Canada often involves a multidisciplinary team consisting of medical and social service professionals (Chudley et al., 2005; Cook et al., 2015). The multidisciplinary team must consider information from multiple sources including school and hospital records, reports from social services, and previous assessments (Chudley et al., 2005). The updated Canadian guidelines for diagnosis provide recommendations regarding the screening, referral, and support process for pregnant or postpartum women (Cook et al., 2015).

The screening and referral process of diagnosis includes screening of women during pregnancy and should be used to identify and refer pregnant women who are at risk for having an alcohol exposed pregnancy (Chudley et al., 2005; Cook et al., 2015). In detail, all pregnant women should be asked about their alcohol use using a validated assessment tool and women who are at a higher risk should be referred to further services such as counselling (Cook et al., 2015; Jones, Bailey, & Sokol, 2015). Validated assessment tools such as the CRAFFT and the CAGE should be used because they are able to detect problem drinking with accuracy in pregnant and nonpregnant women, and/or teenagers, eliminating biases (Loock, Conry, Cook, Chudley, & Rosales, 2005). The new guidelines stress that complete abstinence from alcohol during the gestational period should be recommended to all women (Cook et al., 2015). Referral and screening also apply to children of alcohol exposed pregnancies, meaning that an individual suspected of having FASD should be referred to the appropriate professionals and services (Chudley et al., 2005; Cook et al., 2015). Furthermore, the diagnostic process should involve a full medical and social history, along with a comprehensive physical examination of the parent (Cook et al., 2015). The medical examination portion of the diagnostic process should include thorough testing by a licensed doctor that includes a consideration of any differential diagnoses or alternative causes for the patient's symptoms (Chudley et al., 2005; Cook et al., 2015). The treatment and follow up stage of diagnosis involves educating the patient and family members on FASD, which should be done in a sensitive and culturally appropriate manner (Chudley et al., 2005; Cook et al., 2015). A member of the diagnostic team should follow up with the patient and referrals should be given to other services that may benefit the patient (Chudley et al., 2005).

In the previous guidelines, the final component that was necessary for diagnosis was a confirmation of maternal alcohol consumption during pregnancy (Chudley et al., 2005). As there

is no way to definitely identify a woman who has been drinking during pregnancy, this posed a considerable barrier in the prevention and diagnosis of FASD (de Sanctis et al., 2011), leading to the development of an “at risk” category in the new Canadian diagnostic guidelines (Cook et al., 2015). It can be difficult to establish a history of prenatal alcohol exposure as patients are not always forthcoming about their drinking habits or they may not accurately remember the timing and amount of alcohol consumed during the gestational period (de Sanctis et al., 2011), so the new category in the updated Canadian diagnostic guidelines eliminates some of the previous barriers to diagnosis. It should be clarified that the “at risk” category is not a definitive diagnosis, but a designation that allows medical and social service professionals to monitor the individual until further data can be collected. Once more data become available, the “at risk” designation will either be confirmed and the diagnosis will be updated, or the “at risk” diagnosis will be withdrawn (Cook et al., 2015). It is estimated that diagnosing one individual with FASD in Canada requires 32 to 47 hours and up to \$4,570; representing a significant expense in terms of time and healthcare spending and contributes to the overall cost of FASD in Canada (Popova et al., 2013).

The Cost of FASD

Fetal Alcohol Spectrum Disorder (FASD) is one of the more common preventable developmental disabilities and the most common preventable cause of intellectual disability (Banakar et al., 2009; Coons, 2013; Lupton, Burd, & Harwood, 2004; Townsend, Hammil, & White, 2015). In addition to the social and physical costs to the individuals and their families, FASD also has a high cost to society. Estimates for 2013 place the total cost of FASD to Canadian society at somewhere between \$1.3 billion and \$2.3 billion annually (Popova, Lange, Burd, & Rehm, 2015a). FASD also has an impact on spending in the Canadian correctional

system as individuals with FASD are more likely to come into contact with the legal system (Popova, Lange, Burd, & Rehm, 2015b). The costs to the correctional system in 2011/2012 were computed at \$13.6 million for male youth and \$3.8 million for female youth, as well as \$140 million for adults in provincial and territorial custody and \$216.2 million for adults in federal custody (Popova et al., 2015a). These large expenditures may be attributable to the fact that Canadian juveniles with FASD are 19 times more likely to come into contact with the legal system than their counterparts without FASD (Popova, Lange, Bekmuradov, Mihic, & Rehm, 2011). Individuals with FASD may be more likely to come into contact with the legal system due to the multitude of primary and secondary disabilities that may be present (Popova et al., 2015). As a result of some of the secondary disabilities associated with FASD, individuals also tend to commit more sexual offences, which can contribute significantly to the cost in the criminal justice system (Brown et al., 2010). Issues in executive function may result in unintentional rule breaking and inappropriate touching, especially in adolescents who are just discovering their sexual urges (Brown et al., 2010). All of these issues contribute to the cost of FASD and highlight the importance of early prevention as well as the need to understand what individuals know about prenatal drinking.

Risk Factors

Though FAS and alcohol related neurodevelopmental disorder (ARND) were generally considered to be the most severe outcomes on the spectrum in the previous diagnostic guidelines, the degree of neurodevelopmental damage to each individual fetus depends on the interaction of several factors, including maternal drinking patterns, differences in genetic susceptibility, timing of the alcohol consumption during pregnancy, and variation in the vulnerability of different brain regions (Chudley et al., 2005; Dodge, Jacobson, & Jacobson, 2014; Maier & West, 2001).

Alcohol crosses the placenta with little difficulty resulting in a similar blood alcohol content level for both the mother and the fetus (Nykjaer et al., 2013). During pregnancy, alcohol is known to act through multiple mechanisms to cause damage, resulting in the range of observed disabilities in individuals with FASD (Chudley et al., 2005; Goodlet & Horn, 2001; Goodlet, Horn, & Zhou, 2005). There are very few studies that have examined the specifics in relation to timing of alcohol consumption and effects on the fetus in humans (Nykjaer et al., 2013).

The current advice given to pregnant women in countries such as Canada and Australia is that there is no amount of alcohol that has been proven to be safe during pregnancy (Beckett, 2011). Recent studies have indicated that alcohol exposure at levels equivalent to two servings of wine or beer can increase the risk of neurodevelopmental problems and preterm birth (O'Leary & Bower, 2012; O'Leary, Nassar, Kurinczuk, Bower, 2009; O'Leary et al., 2010). This finding indicates that there is a very small margin at which harm can occur, leading to increased risk among women (O'Leary & Bower, 2012). Despite the lack of consistent findings in regards to low-levels of alcohol consumption during pregnancy, researchers warn that absence of proof is not an endorsement of safety (Henderson et al., 2006; O'Leary & Bower, 2012). As there is currently no strong evidence indicating that low doses are unequivocally safe and we may never be able to conclusively prove whether low levels of alcohol are safe, the most ethical advice to women remains to be abstinence (O'Leary & Bower, 2012). There is no hesitation from society when advising women not to consume foods that may put them at risk for listeriosis, though the risk for fetal harm from listeria is lower than that of alcohol exposure (O'Leary & Bowers, 2012; Torvaldsen, Kurinczuk, Bower, Parsons, & Roberts, 1999). This difference indicates that the push-back from society regarding abstinence during the gestational period may not be actually related to the level of risk.

FASD in context. Although there is no level of alcohol that can be considered “safe” for women to drink during pregnancy, there are some factors that can put the fetus at greater risk for FASD (Beckett, 2011). One of the few studies that examined the timing of alcohol consumption and effects on the fetus found that drinking is most damaging in the first trimester of pregnancy as well as the period directly preceding conception (Nykjaer et al., 2013). The first trimester is a period of time where the fetus is particularly vulnerable to the effects of alcohol because it is a time of significant organ growth and development for the fetus (Kesmodel, 2001). As can be expected, drinking was found to be most prevalent in the sensitive first trimester period when some women did not yet recognize the pregnancy, and then rates were reduced as the pregnancy progressed (Nykjaer et al., 2013; Pryor, Patrick, Sundermann, Wu, & Hartman, 2017). Percentages of British women drinking in the first trimester were reported at 79%, decreasing to 63% in the second trimester, and then tapering to 49% in the third trimester (Nykjaer, 2013). In a 2011 study of Canadian women, it was found that there was a 10% prevalence rate for drinking during pregnancy (Walker et al., 2011). Globally, it has also been found that approximately 10% of the general population consumes alcohol during the gestational period (Popova, Lange, Probst, Gmel, & Rehm, 2017). In a sample of Canadian Inuit women it was found that although one fifth of the women stopped consuming alcohol while pregnant, 60% of the sample still reported consuming large quantities of alcohol while pregnant (Muckle et al., 2011). The high prevalence of alcohol consumption in the aforementioned Canadian and international samples represents a large proportion of pregnancies that are at risk for FASD.

A recent literature review by Coons (2013) identified several key factors that may play a role in the degree to which FASD is expressed in the affected individual. Coons (2013) identified nutrition of the mother during the gestational period and the lifetime, genetic factors such as

missing enzymes, familial and demographic characteristics such as family history of drinking, and cultural issues as being important risk factors for the development of FASD. In terms of nutrition, it was found that high levels of FASD in South Africa were at least partially attributable to substandard nutrition of the mother and the children in that area (Coons, 2013). Specific nutrient deficiencies that have been linked to FASD include riboflavin, calcium, docosapentaenoic acid (DPA), zinc, and B vitamins (Coons, 2013). Though individual factors that put women at risk for having an alcohol-exposed pregnancy are often discussed, it is important to keep in mind that FASD is a social issue that affects all Canadians, therefore further education and awareness aid all Canadians, including vulnerable populations, to make better health choices (Chudley et al., 2005; Popova, Lange, Burd, & Rehm; 2015; Popova, Lange, Probst, Gmel, Rehm, 2017).

Cultures that are accepting of heavy drinking and recreational drinking activity tend to be at higher risk for FASD (Coons, 2013). Canada's Public Health Agency emphasizes that FASD does not occur in a vacuum and must be viewed along with other potentially harmful realities such as poverty, low social support, abuse, and socioeconomic status (Public Health Agency of Canada, 2005). To expand further, it was found that experiencing intimate partner violence (IPV) during pregnancy tended to correlate with increased substance abuse during pregnancy (Fanslow, Silva, Robinson, & Whitehead, 2008). Though it was not a significant finding, Fanslow and colleagues (2008) found that women who experienced IPV during pregnancy reported higher incidences of drinking during pregnancy than women who did not experience IPV; 31% and 20% respectively. Being exposed to interpersonal violence in childhood or in previous relationships tended to be correlated with drinking before and after pregnancy recognition (Choi et al., 2014). Yen and colleagues (2012) also found that experiencing IPV was significantly associated with

drinking after the recognition of pregnancy in a sample of Indigenous pregnant women in Taiwan.

Pattern of consumption. Binge drinking, defined as consuming four or more drinks in one sitting, is one of the behaviours that is most damaging to the developing fetus (May & Gossage, 2011). Binge drinking is especially harmful because it produces a very high peak blood alcohol content (BAC), which is very damaging to the developing fetus (May & Gossage, 2011). Due to the particularly damaging effects of binge drinking, individuals who engage in binge drinking behaviour may be especially susceptible to having a fetus affected by alcohol. Frequency of use during the gestational period is also an important factor in determining the risk of a fetus developing FASD. Though there is no established safe frequency of alcohol consumption, women who drink regularly and frequently are more likely to have a fetus with FASD with more significant impairments (May & Gossage, 2011). Research into binge drinking has demonstrated that drinking patterns change significantly in the first few weeks of pregnancy with binge drinking becoming a rare occurrence after the 7th week (Kesmodel, 2001). Drinking habits may also be affected by outside variables such as drinking habits of a woman's partner, leading to a call for further exploration of the factors that affect drinking habits during the gestational period (Chang, Mcnamara, Orav, & Wilkins-Hung, 2006).

Partner drinking habits. Partner drinking habits are likely to influence the drinking habits of pregnant women (May et al., 2005) and it has been found that maternal drinking tends to be correlated with paternal drinking (Chang et al., 2006); however in the literature, there have been mixed results when looking at the effects of partners on the substance use of their pregnant spouses. Some studies reported that women are pressured and influenced by the choices of their male companions (Bottorff et al., 2014; Chang, Mcnamara, Orav, & Wilkins-Haug, 2006; Elek et

al., 2013; Everett, Bullock, Longo, Gage, & Madsen, 2007; Logan, Walker, Nagle, Lewis, & Wiesenhahn, 2003; Walker et al., 2011) and others reported that partners did not pressure or have a significant effect on the substance use of their spouses (Chang et al., 2006; Elek et al., 2013). Partners have complex reasons for deciding to decrease their alcohol use during the gestational period, these reasons included the pregnancy itself, being involved in fewer social situations that may involve alcohol, and a feeling of responsibility for their pregnant partner (Högberg, Skagerström, Spak, Nilsen, & Larsson, 2016).

During a scoping review of the literature available on teens and young adults, Bottoroff and colleagues (2014) found that the substance use of the male partners was often ignored by researchers despite the substance misuse patterns of boyfriends and best friends greatly affecting the substance abuse of the pregnant individual. Chang and colleagues (2006) found that partners' scores on tests related to knowledge about the risks of alcohol consumption during pregnancy were predictive of their female partners' scores. When women were interviewed in focus groups, women stated that their partners generally believed that women should abstain from drinking during pregnancy (Elek et al., 2013). Despite this belief that pregnant women should abstain, some women stated that their partners continued to drink around them during their pregnancy and a few individuals stated that their partner encouraged them to drink (Elek et al., 2013). Though there were some partners who encouraged negative behaviours, some of the women interviewed stated that their partners encouraged them to abstain by reinforcing their decision not to drink, not to be around individuals who are drinking, not bringing alcohol into the home, and leaving situations where the women may not be comfortable (Elek et al., 2013).

Everett and colleagues (2007) found that hazardous drinking—defined as five or more drinks per day in a month—by an expectant father was also related to smoking during pregnancy.

Hazardous drinking of expectant fathers was also related to the drinking behaviours of his partner (Everett et al., 2007). In a study of rural populations, Logan and colleagues (2003) found that alcohol use by a male partner can pose a barrier to treatment for alcohol dependence for pregnant women. It was also found that men had a very low level of knowledge in regards to the seriousness of drinking during the gestational period (Logan et al., 2003). When men do not understand the issue, they tend to be much less tolerant and supportive of a woman's choice to seek treatment (Logan et al., 2003). Male partners may actually discourage their female partners' recovery because of their own drinking patterns (Logan et al., 2003). Finally, Walker and colleagues found in their 2011 study that Canadian women were twice as likely to drink during pregnancy simply if they have partners. Although they found that simply having a partner resulted in an increase in the likelihood of drinking during pregnancy, Walker and colleagues (2011) did not collect data on the actual drinking habits of the partner, so it was not possible to study the link between maternal and paternal drinking further.

Though there are many findings that support the notion that paternal drinking may influence maternal drinking, there are several studies that have demonstrated that there is no link between the two. In a study investigating the predictive nature of knowledge on the risk of drinking during pregnancy, Chang and colleagues (2006) found that partner alcohol consumption was not predictive of prenatal alcohol consumption. Additionally, Elek and colleagues (2013) found that a woman's partner could either be a strong supporter or detractor of a woman's choice not to drink during pregnancy. These mixed results highlight the importance of developing an investigation into the knowledge of both women (who may potentially become pregnant) and men (who may one day become the partner to a pregnant women).

Personal factors. Age may be an important predictor of drinking during the gestational period as young women from a sample at the University of Michigan were more likely to have an alcohol exposed pregnancy, especially college aged women (Walker et al., 2005). Roberts, Wilsnack, Foster, and Delucchi (2014) found that women who had a higher than high school education had more elevated levels of alcohol consumption at baseline. During a study by Abbey, Saenz, Buck, Parkhill, and Hayman (2005), it was found that intoxicated college-aged individuals were more willing than other participants to have unprotected sex with a partner; this finding is concerning because it has been estimated that half of pregnancies in Canada are not planned (Sanders & Currie, 2014). Studies have demonstrated that some individuals continued drinking after discovering that they had unintentionally become pregnant (Blake et al., 2007; Roberts et al., 2014; Terplan, Cheng, & Chisholm, 2014).

Research has found that women who had unintended pregnancies tended to have more risky drinking behaviour during the period before pregnancy recognition (Roberts et al., 2014). Women who want to terminate their pregnancy but are denied a termination tend to have already consumed higher levels of alcohol during pregnancy and public health information does not work to reduce drinking for this population (Roberts, Delucchi, Wilsnack, & Foster, 2015). Further research has found that Canadian women who became pregnant unintentionally and were not happy about it were more than twice more likely to drink during their pregnancy than their happy counterparts (Walker et al., 2011). Furthermore, low dispositional optimism was associated with increased drinking behaviour (McDonald et al., 2014; Stene-Larsen, Torgersen, Strandberg-Larsen, Normann, & Vollrath, 2013). Stene-Larsen and colleagues (2013) found that for each 1 unit increase of maternal negative affect, drinking increased 27% in the first trimester and 28% in the second semester. Research has also found that of the women who did binge drink

during the first trimester, 87% ceased drinking once they recognized that they were pregnant (Muggli et al., 2016). Approximately one third of the women included in Muggli and colleagues' (2016) sample continued to drink a low to moderate amounts throughout their pregnancy. The women that did continue to drink during the gestational period were in their early to mid-thirties, more likely to smoke, had higher income, and higher educational achievement (Muggli et al., 2016). As certain individuals are more likely to drink prior to and during the gestational period, it is imperative to further study which factors may lead to higher substance misuse.

Substance use trends among adolescents and young adults are particularly concerning. In a literature review, Bottoroff and colleagues (2014) found that many teenagers increased their consumption of tobacco products as their pregnancies progressed and that young women were at risk for continued substance misuse after their pregnancies. Drinking during the sexual debut was a significant predictor of drinking during pregnancy for adolescents, as well as an observed trend for drinking later in pregnancy after coercive sexual contact (DeGenna, Larkby, & Cornelius, 2007). Individuals who began drinking earlier were more likely to continue drinking throughout their pregnancy (DeGenna et al., 2007). For this reason, it is important to include late adolescents and young adults in studies regarding gestational alcohol consumption.

Knowledge of Prenatal Drinking Risks

Many studies demonstrate that individuals of childbearing age are aware of the effects of alcohol, but the knowledge does not always correlate to actions being taken to reduce the risk (Little, Grathwohl, Streissguth, & McIntyre, 1981; Meurk, Broom, Adams, Hall, & Lucke, 2014). Many women are misinformed about what is a safe amount of alcohol consumption during pregnancy (Beckett, 2011; Elek et al., 2013; Kesmodel & Kesmodel, 2002; Little et al., 1981; McKnight & Merrett, 1987; Toutain, 2010). When asked, the majority of women know

that alcohol is harmful to the developing fetus and should not be consumed during the gestational period (Peadon et al., 2010), although there is considerable confusion when it comes to what a “safe” amount is (Environics Research Group Limited, 2000). In a focus group study by Elek and colleagues (2013), women stated that they believed that some types of alcohol were less harmful to the developing fetus; specifically, wine was listed as being the least harmful. As this is not a claim based in evidence, it demonstrates that individuals do not really understand the harms that alcohol may pose to the fetus or the mechanisms by which harm occurs. Some of this confusion may come from the fact that healthcare professionals are also not particularly informed of the risks of drinking during pregnancy. Women in Elek and colleagues’ (2013) study reported that their health care provider had told them that it was safe to consume alcohol during the third trimester of pregnancy.

Professionals’ knowledge. Almost half of all Canadian women surveyed by Environics Research Group Limited (2000) thought that their primary medical professional was the best source of information regarding alcohol consumption during the gestational period. The preference for individuals to seek knowledge from their doctor demonstrates that people place significant trust in their doctors, but research has consistently demonstrated that healthcare providers may provide questionable information to pregnant women (Crawford-Williams, Steen, Esterman, Fielder, & Mikocka-Walus, 2015). In a study by Inoue, Entwistle, Wolf-Branigin, & Wolf-Branigin (2017) it was found that approximately 1 in every 10 of the various American healthcare professionals included in the sample believed that alcohol is safe during any period of the pregnancy. Furthermore, in a study of American obstetric and gynaecological doctors (OB/GYN), who should theoretically have the most knowledge about health during the gestational period, it was found that approximately 1 in 10 practitioners believed that alcohol

consumption was safe during the first trimester and over 20% viewed alcohol consumption as safe during the second and third trimesters (Anderson et al., 2010). A recent study of Canadian medical professionals also found that approximately 1 in 10 healthcare professionals provided advice other than abstinence to women during pregnancy (Coons, Clement, & Watson, *in press*). Though 1 in 10 seems fairly small, the impact of this misconception is fairly extensive as that one healthcare provider may influence multiple patients, leading to an exponential spread of misinformation. In a study by Crawford-Williams and colleagues (2015), women in the South Australian sample stated that they were given limited information about alcohol consumption and pregnancy; often the subject was broached during the initial appointment and then never discussed again. Some women reported never receiving information or receiving unclear or conflicting messages about alcohol consumption from their general practitioners (Crawford-Williams et al., 2015). In a study of Canadian doctors, it was found that less than half of medical providers discussed alcohol use and other risky behaviours such as smoking with women of child bearing age (Tough, Clarke, Hicks, & Clarren, 2005). In a study of medical practitioners in Western Australia, it was found that only 12% of health care professionals from a variety of fields understood the diagnostic criteria for FAS and were able to apply them (Payne et al., 2005).

In Crawford-Williams and colleagues' (2015) study, some participants stated that they were encouraged by their midwives to consume alcohol should they have a strong craving. In a study of midwives in Australia, it was found that midwives wanted more education regarding the risk of alcohol consumption during the gestational period because they did not feel confident in their level of knowledge in the area; however, they did attempt to adhere to the Australian guidelines that recommend complete abstinence when giving advice to expecting mothers (Payne

et al., 2014). The lack of evidence-based advice given by midwives may be partially explained by the finding that midwives were 2.5 times more likely to agree that alcohol consumption during pregnancy was safe during the third trimester (Inoue et al., 2017).

In a survey of Australian paediatricians, it was found that most paediatricians were able to recognize the abnormal facial and growth features essential to FASD (Elliott, Payne, Haan, & Bower, 2006). Despite knowing the growth and facial characteristics related to FASD, only 18.9% of the Australian paediatricians knew all of the essential diagnostic features (Elliott et al., 2006). When advising pregnant individuals, the majority of physicians indicated that they advised pregnant women not to drink at all, but over a third of all paediatricians gave advice that included a “safe” amount of alcohol to drink during pregnancy (Elliott et al., 2006). Only 11.4% of the paediatricians surveyed had actually read the Australian guidelines regarding alcohol consumption during pregnancy and only 9.1% of physicians gave out advice that incorporated all aspects of the national guidelines (Elliott et al., 2006). As paediatricians are potentially ignoring the national guidelines, this indicates that women may be receiving advice that could put them at risk for an alcohol exposed pregnancy. Though training differs between Canadian and Australian medical practitioners (McGrath, Wong, & Holewa, 2011), practitioners in both countries have similar issues with diagnosis and treatment of disorders, and the FASD guidelines in each country recommend complete abstinence (Pachana, Emery, Konnert, Woodhead, & Edelstein, 2010; Payne et al., 2014). As the countries have many similarities in their medical systems and their conceptualization of FASD, the Australian literature has applicability to the Canadian context. Additionally, Canadian men and women view Australians as a similar outgroup, lending credence to the notion that the two populations may hold similar values (Connick-Keefer, 2017).

In addition to studies conducted in Australia with paediatricians, it has also been found that OB/GYNs in the United States do not consult or follow the clinical guidelines put forth by the National Institute on Alcohol Abuse and Alcoholism (Anderson et al., 2010). Specifically, it was found that only 2.1% of OB/GYNs surveyed used the clinician guidelines with pregnant patients only, 0.5% used the guidelines with non-pregnant patients, and 1.9% used the clinician's guidelines with all patients (Anderson et al., 2010). The other OB/GYNs surveyed remembered reading the guidelines, but could not recall any specifics from the documents and, therefore, did not incorporate them into their practice or had no interest in the guidelines (Anderson et al., 2010). It was also discovered that most OB/GYNs do not know about or utilize another common resource, the American College of Obstetricians and Gynecologists FASD Prevention Tool Kit, and less than 10% use validated alcohol risk screening tools in their practice (Anderson et al., 2010).

Studies involving individuals in medical school have also identified deficiencies in knowledge; students could identify the unique physical features necessary for a diagnosis of FAS, but there was wide variability in answers regarding what constitutes a "safe" amount of alcohol to consume during pregnancy (Arnold et al., 2013). Specifically, medical students were able to identify the features necessary for a diagnosis of FASD but there was no consensus on what constitutes a safe amount of alcohol for consumption during the gestational period (Arnold et al., 2013). Additionally, it has been found that nursing students could benefit from more training on how to screen and intervene in cases that may develop into FASD (Zoorob, Durkin, Gonzalez, & Adams, 2014). After receiving training in intervention for alcohol related issues, nurses reported feeling more confident in their use of alcohol screening, interventions, and treatments (Zoorob et al., 2014).

Mental health professionals often have an opportunity to intervene in cases where women may be at risk for consuming alcohol during pregnancy (Wedding et al., 2007). Unfortunately, most psychologists are uninformed about the manifestations of FAS and FASD and do not know how to intervene in cases where women are at risk for having an alcohol exposed pregnancy (Wedding et al., 2007). Over 70% of Canadian psychiatrists surveyed by Tough, Clarke, and Hicks (2003) stated that they did not believe that it was their responsibility to deal with alcohol related problems such as FASD, and the responsibility rested with the primary care physician. One of the most concerning findings of the survey by Wedding and colleagues (2007) was that 11% of psychologists thought that occasional use of alcohol was safe for the developing fetus. This lack of knowledge among various healthcare professionals highlights the fact that like most laypeople, professionals also lack knowledge regarding all aspects of FASD leading to the potential for the spread of misinformation.

FASD and media. Research indicates that Canadian men and women reported seeing information in brochures and pamphlets or in the popular media, which often presents misinformation, along with their medical professional (Enviroics Research Group Limited, 2000). Further research has indicated that many Canadian men and women lack knowledge regarding alcohol consumption during the gestational period and do not feel comfortable breaching the subject of drinking during pregnancy with others, therefore other approaches should be utilized to disseminate knowledge (Burgoyne, Willet, Armstrong, Best Start Resource Centre, Enviroics Research Group, 2006; Kyskan & Moore, 2005; Lowe, Baxter, Hirokawa, Pearce, & Peterson, 2010). In a review of public health media campaigns regarding FASD conducted by the territorial government of the Yukon, it was found that the studies used to assess these campaigns were of poor methodological design (Ospina, 2013). Specifically, the majority

of the studies did not include a comparison group, which could lead to an overestimation of the effectiveness of interventions (Ospina, 2013). So, although many of the studies that they examined had significant results, these results pertaining to the studies examining the effectiveness of public health media campaigns related to FASD should be interpreted with caution and may not be suitable to rely on when making public health decisions related to these campaigns (Ospina, 2013).

In 2004, Ontario launched their first province-wide campaign on the prevention of prenatal alcohol exposure, the “Be Safe” campaign (Burgoyne, et al., 2006). The “Be Safe” campaign is designed to target women of childbearing age and to inform them that there is no safe amount or time to drink alcohol during pregnancy (Burgoyne et al., 2006). Evaluation of the program demonstrated that the campaign was successful in translating knowledge regarding alcohol use during pregnancy to women of childbearing age, as there was an increased level of awareness regarding the risk of drinking during pregnancy in the sample on a post-campaign survey (Burgoyne et al., 2006). Lowe and colleagues (2010) tested a multimedia-based intervention program and found that it produced a statistically significant improvement in knowledge surrounding alcohol consumption as compared to control groups. A study by France and colleagues (2014) found that their media-based program was effective at increasing women’s intentions to abstain from drinking alcohol as compared to the control condition. The test of the campaign found that messages were the most effective when they combine a threat with a self-efficacy message (France et al., 2014). Between the years 2000 and 2004, there were only three alcohol and pregnancy campaigns in Canada that were able to measure campaign recall and levels of awareness (Burgoyne et al., 2006). The campaigns were implemented in Alberta, Manitoba, and Quebec and they all showed at least some positive evaluation results (Burgoyne et

al., 2006). Messages about alcohol cessation during pregnancy in the United States advise complete abstinence and do not highlight the benefits of quitting later during the pregnancy (Roberts et al., 2014). Messages that do not highlight the benefits of alcohol cessation later in pregnancy may also not be appropriate for women carrying unwanted pregnancies who have already consumed alcohol prior to pregnancy recognition (Roberts et al., 2014). Furthermore, it has been found that commonly used prevention messages can stigmatize women as these campaigns do not often address the factors which may contribute to a woman's drinking (Bell et al., 2016; Bell et al., 2015).

Though media campaigns can have a positive impact on knowledge of the risks of drinking during pregnancy, the media can also have a deleterious effect. When celebrities or non-experts speak about healthcare issues, such as the question of the safety of vaccines, they may not present an accurate picture of the science (Larson, Cooper, Eskola, Katz, & Ratzan, 2011; Williams, 2011). British actress Rachel Weisz caused a similar stir in the world of FASD prevention when she proclaimed that it was safe to drink wine after the first trimester (Connolly-Ahern & Broadway, 2008). In a review of news stories published about FASD over a 10 year period, it was found that people were likely to encounter information about FASD in three main types of stories: health features, special interest stories, and public safety news (Connolly-Ahern & Broadway, 2008). Though the news stories tended to offer advice to women on avoiding FASD, they often added to the confusion as the "experts" quoted often offered contradictory information (Connolly-Ahern & Broadway, 2008). For example, the news media recently reported on a study that claimed that it was safe to drink up to 1.5 servings of alcohol if a woman was at least 3 months pregnant (Williams, 2011). What the news failed to report was that the methodology utilized retrospective reports and did not "prove" that alcohol consumption was

safe (Williams, 2011). In addition to news media being inaccurate, pregnancy advice books can sometimes present advice regarding alcohol that is inaccurate or not based in fact (Raymond, Beer, Glazebrook, & Sayal, 2009; Tierney, 2005). Along with inaccurate news media and pregnancy advice books, people are increasingly turning to the internet for advice regarding pregnancy and alcohol consumption (Tierney, 2005). There are plenty of internet sources that are very informative, but there are also many that are not; each of which may be chosen by Canadian women looking for information (Di Pietro, Whiteley, Mizgalewicz, & Illes, 2013; Tierney, 2005). A study by Environics Research Group Limited (2000) indicates that 5% of Canadians receive their information regarding FASD from the internet, indicating that a considerable portion of the Canadian population may not be receiving accurate information.

Environics Research Limited study. The current study is an update on research conducted by Environics Research Limited on behalf of Health Canada (2000). The Environics Research Limited study (2000) polled 1,205 individuals including 902 women and 303 men between the ages of 18 and 40 from across Canada during the period of November 26 to December 9, 1999 in order to discover what Canadians know about drinking during pregnancy. The survey was available in English and French, both of Canada's official languages, in order to effectively capture Canada's population (Environics Research Limited, 2000). This study polled a diverse sample of Canadians and had several key findings that have informed the field of FASD prevention in Canada.

Environics Research Limited (2000) found 66% of the Canadian sample knew that alcohol is harmful to the developing fetus, but there was a high level of confusion regarding what constitutes "safe" and there was even more uncertainty about the safety of small amounts of alcohol. Seventy-one percent of participants had heard of FAS, but there was a relatively low

level of knowledge regarding the specifics of the disorder (Environics Research Limited, 2000). Many women were aware of FAS and FAE, but there was little knowledge of what these disorders actually constitute (Environics Research Limited, 2000). Though levels of knowledge regarding FAS, FAE, and safe amounts of alcohol were fairly low in this sample, there were certain factors that affected level of knowledge. The study found that men, women from Quebec, and women who have greater alcohol consumption were more likely to believe that consuming alcohol during pregnancy was safe, and women with lower education tended to have less knowledge about the risks of alcohol consumption during pregnancy (Environics Research Limited, 2000). These results point to several factors that influence knowledge on the risks of drinking during pregnancy, highlighting the need for further education and study in the area.

Seventy-two percent of respondents reported seeing information about the effects of alcohol during pregnancy and supported further efforts to inform the public about the risks of consuming alcohol during the gestational period (Environics Research Group Limited, 2000). Participants reported seeing information in brochures and pamphlets or in the media (33%), television programs (24%), or from health care professionals (23%). Additionally, participants reported gaining information from books (15%), posters (12%), magazine advertising (11%), infant care groups (6%), school or special classes (6%), and personal experiences (5%) (Environics Research Group Limited, 2000). Forty-seven percent of the participants reported that they would prefer to get their information from their health care professional, with a smaller amount of people reporting that they preferred to get their information from books and magazines, health clinics, TV programs, internet sources, and information from Health Canada.

Eleven percent of participants stated that they would cut back their use of alcohol were they to become pregnant, meaning that over the majority of participants would anticipate

reducing their alcohol intake during the gestational period. Four percent of the women polled stated that they would not change their alcohol use at all during the gestational period (Environics Research Group Limited, 2000). Thirty-nine percent of women stated that they were more likely to reduce their alcohol consumption during pregnancy if their partners did the same. Another 39% of women in this sample said that they would not be affected by their partner's drinking behaviour; this split in the result shows that there is no real consensus on the effects of partner drinking habits or that some women do not perceive their partners to be an influence on their behaviour (Environics Research Limited, 2000). Men were not likely to state that they would stop drinking completely during their partners' pregnancy (Environics Research Group Limited, 2000). More than 70% of the men polled in this sample stated that they would be very likely to encourage their partners to stop or cut back on drinking behaviours during pregnancy.

The Current Study

This thesis is part of a larger project collecting data from across Canada, but the thesis will focus specifically on women from Ontario. The current study provided an update to the information on Ontarian knowledge regarding drinking during pregnancy gained in the 2000 study. The purpose of this thesis was not to provide a direct comparison to the Environics Research Group Limited (2000) study as it focuses only on women living in Ontario. This thesis is part of a larger project collecting data from men and women across Canada, which will allow for a direct comparison to the results of Environics Research Group Limited (2000). The past 17 years have offered a lot of new research and prevention campaigns; performing the study again allowed for an update to the Ontarian statistics regarding drinking during the gestational period, reflecting changes in society. This study attempted to gain information on how much Ontarians support drinking during the gestational period and where they received their information about

the risks of drinking during pregnancy. The current study modernized the methodology of the Environics Research Limited (2000) study to reflect the technological advances over the last decade and a half by using social media as a recruitment tool rather than using telephone polling. The survey was available in both English and French and collected information regarding maternal health in general and specific information regarding alcohol consumption during pregnancy. The aim of this study was to examine the level of knowledge regarding FASD and alcohol use during pregnancy in a sample of women from Ontario.

The objectives were to examine the following research questions:

1. What do females over the age of 18 from Ontario know about drinking during pregnancy?
2. What factors influence perceptions of alcohol consumption during pregnancy?
3. Where do females over the age of 18 get their information about the risks of consuming alcohol during pregnancy?
4. Are there any differences among participants in support for warning labels informing Canadians about the risks of drinking during pregnancy?

Methodology

This thesis study employed a survey approach. The survey used in this research was developed by Environics Research Group Limited, as previously discussed. A question regarding whether participants had spoken to their medical professional was added to the survey in order to fill a gap in the knowledge gained by the previous iteration of this study. This survey was selected because it collects information regarding knowledge of various health related issues during the gestational period, including alcohol use.

Materials. The survey (Environics Research Limited, 2000) included several sections that are pertinent to the research questions of this study and was available in both English and French. The survey began by collecting general information regarding knowledge of a number of health related issues during pregnancy (e.g. “Thinking about healthy infants and children, what, in your opinion, are the most important things that pregnant women can do to increase the likelihood that their baby will be born healthy?”). After answering general questions regarding health behaviours during pregnancy, participants were asked specific questions regarding alcohol consumption during pregnancy (e.g. “In terms of its effect on a baby that is born, do you think it would be very safe, somewhat safe, not very safe, or not at all safe for a pregnant woman to drink each of the following amounts of alcohol?”). There were individual sections of the surveys for both women and men. Women were asked about their previous pregnancy histories, whether they planned to become pregnant in the near future, and their intended behaviour should they become pregnant. Men were asked about their number of children, current or future pregnancy status of their partners, and their intended behaviour during that pregnancy. At the end of the survey, all participants were asked for demographic information such as age and level of education.

Participants. Two-hundred and sixty-six participants were recruited from across Canada through word of mouth and social media postings on popular websites such as Facebook, Twitter, and Reddit. The mean age of the total sample was 28.56 ($SD = 9.35$) and the demographic characteristics of the larger sample are presented in Table 1.

Table 1: *Demographics of the total sample*

Characteristic	Percentage
Province	
Alberta	1.2
British Columbia	4.7
New Brunswick	0.4
Nova Scotia	2.0
Nunavut	0.4
Ontario	90.2
Quebec	0.4
Saskatchewan	0.4
Yukon	0.4
Gender	
Male	13.6
Female	86.4

In order to assure a more homogeneous sample, only women from Ontario were included in the analysis for this thesis; results from the larger sample will be reported at a future date. The sample which only included females from Ontario differed from the larger sample. The mean age of the female Ontarian sample was 27.62 years ($SD = 8.94$) and the demographics are presented in both of the manuscripts contained in this thesis.

Procedure. Participants were recruited through an online platform, as this recruitment strategy provided access to a wide audience, resulting in a large sample of Canadians. Participants were recruited through social media websites and directed to the survey link. After clicking the link, participants were directed to the survey, which was housed on REDCap (Research Electronic Data Capture) hosted at Laurentian University (Harris et al., 2009). REDcap was selected because it offers a high level of anonymity and security for the collected data. Participants were asked to read and complete an electronic consent form, which provided information on the study and had contact information for the researchers and the ethics board, should an individual have any questions. After consenting to participate, participants were

directed to the survey (Enviroics Research Group Limited, 2000). After completing the survey, participants were directed to a “thank you” page that also provided additional information regarding alcohol use during pregnancy and FASD.

Conclusion and Overview of Subsequent Chapters

The first manuscript included in this thesis focused on what women from Ontario knew about drinking during the gestational period. The survey used in this research had several questions about the perceived safety of drinking behaviours and support for those behaviours. The second manuscript focused on where the women were receiving their information and their perceptions and preferences in terms of those information sources. The survey had several questions regarding where women remember seeing information, where they would like to receive their information, and the newly added questions regarding what information the women had received from their healthcare professional.

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Chapter 2

**Knowledge and Risk Factors for Support of Drinking During Pregnancy in Women from
Ontario**

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Knowledge and Risk Factors for Support of Drinking During Pregnancy in Women from Ontario

Fetal Alcohol Spectrum Disorder (FASD) is a considerable social problem and public health issue among the Canadian population (Chudley et al., 2005; Popova, Lange, Burd, & Rehm; 2015; Popova, Lange, Probst, Gmel, Rehm, 2017). Canada has been quite proactive in their public health response to the issue of FASD prevention and a number of studies have been conducted in the area of FASD prevention in Canada (Environics Research Group Limited, 2000; Lange, Probst, Quere, Rehm, & Popova, 2015; Lange, Quere, Shield, Rehm, & Popova, 2015; McDonald, Hicks, Rasmussen, Naguelsapillai, Cook, & Tough, 2014; Walker, Al-Sahab, Islam, & Tamim, 2011). Though there are numerous studies regarding what Canadians know about drinking during the gestational period, there is a lack of recent literature. As FASD is the most common nonhereditary cause of intellectual disability (Kapasi & Brown, 2017), it is imperative that researchers and clinicians understand what women know about consumption of alcohol during the gestational period in order to effectively prevent future cases of FASD.

Fetal Alcohol Spectrum Disorder

Throughout history, ranging from ancient Greek and Roman mythology to present day, there have been reports of the effects of maternal alcohol consumption on the developing fetus (Banakar, Kudlur, & George, 2009). FASD is an umbrella term used to describe the range of effects on the fetus that may occur when a pregnant woman drinks during the gestational period (Astley & Clarren, 2000; Chudley et al., 2005; Cook et al., 2015; Del Campo & Jones, 2017). Based on a comprehensive literature review, Popova, Probst, Parunashvili and Rehm (2017) estimated that between 10 and 15 percent of women in Canada and the United States consume alcohol during pregnancy. As a substantial portion of Canadian women are consuming alcohol

during the gestational period, FASD represents a serious health concern, public health issue, and social problem among the Canadian population (Onoye & Thompson, 2017; Popova et al., 2015). FASD is a lifelong disorder, meaning that the disabilities start in childhood or are present at birth and persist well into adulthood (Temple, Ives, & Lindsay, 2015). Estimates for 2013 place the total cost of FASD to Canadian society at somewhere between \$1.3 billion and \$2.3 billion annually (Popova, Lange, Burd, & Rehm, 2015).

In addition to the primary disabilities associated with FASD (i.e. impairments in executive function, memory, attention, declarative learning, planning cognitive flexibility, processing speed, IQ, academic achievement; Rasmussen & Bisanz, 2009) , individuals with FASD tend to have common secondary disabilities (Brackenreed, 2015). Secondary disabilities refer to disabilities that are not present at birth, but occur as a result of the primary disability (Caley, Dunlap, Shipkey, Rivera, & Winkelman, 2006). For FASD, common secondary disabilities include inappropriate sexual behaviours, trouble with the law, confinement, substance abuse, disrupted school experience (i.e., suspension, dropping out, etc.), mental health issues, employment issues, dependent living, and problems with parenting (Brackenreed, 2015; Clark, Lutke, Minnes, Ouellette-Kuntz, 2004). These secondary disabilities are thought to be an interaction between the behaviour, mental health issues, and adverse environments experienced by the individual living with FASD (Clark et al., 2004). All of these issues contribute to the cost of FASD, highlighting the importance of early prevention as well as the need to understand what individuals know about prenatal drinking.

Risk Factors for Alcohol Consumption during Pregnancy

Though each individual woman and fetus process alcohol differently, generally the degree to which the developing fetus is impaired by maternal alcohol consumption depends on

several factors including maternal drinking patterns, differences in maternal metabolism, differences in genetic susceptibility, timing of the alcohol consumption during pregnancy, and variation in the vulnerability of different brain regions (Chudley et al., 2005; Idrus, Breit, Thomas, 2017; Maier & West, 2001). Alcohol crosses the placenta with little difficulty, resulting in a similar blood alcohol content level for both the mother and the fetus (Nykjaer et al., 2014). During pregnancy, alcohol is known to act through multiple mechanisms to cause damage, resulting in the range of observed disabilities in individuals with FASD (Chudley et al., 2005 Goodlet & Horn, 2001; Goodlet, Horn, & Zhou, 2005).

Although there is no level of alcohol that is currently considered to be undeniably safe for women to drink during pregnancy, there are some factors that can put the fetus at more risk for FASD (Beckett, 2011). Binge drinking, defined as consuming four or more drinks in one sitting, is one of the most harmful behaviours for the developing fetus because it produces a very high peak blood alcohol content (BAC), which is harmful to the developing fetus (May & Gossage, 2011). Frequency of use during the gestational period is also an important factor in determining the risk of a fetus developing FASD; though there is no established safe frequency of alcohol consumption, women who drink regularly and frequently are more likely to have a fetus with FASD (May & Gossage, 2011).

Certain demographic characteristics, such as age, are associated with an increased risk of drinking during the gestational period. In a nationally representative study of Canadian women using the Canadian Community Health Survey, it was found that being over 40 years of age is associated with alcohol use during pregnancy (Lange, Probst, Quere, Rehm, & Popova, 2015). Another study by Lange, Quere, and colleagues (2015) using a subsample from a nationally representative study found that Canadian women were more likely to be over 35 years of age

than their counterparts who did not consume alcohol during the gestational period. This finding that higher age is associated with alcohol use during pregnancy stands in stark contrast to the finding that smoking during the gestational period is associated with lower maternal age; indicating that alcohol use during pregnancy is a behaviour with unique predictors separate from those of smoking during pregnancy (Lange, Probst et al., 2015). These findings regarding age highlight the importance of further understanding what women of differing ages know about alcohol consumption during pregnancy in order to better design interventions.

Knowledge of Prenatal Drinking Risks

Many women are misinformed about what is a safe amount of alcohol consumption during pregnancy (Elek et al., 2013; Kesmodel & Kesmodel, 2002; Toutain, 2010). When asked, the majority of women know that alcohol is harmful to the developing fetus and should not be consumed during the gestational period, although there is considerable confusion when it comes to what constitutes a “safe” amount (Environics Research Group Limited, 2000; Peadon et al., 2010). As there is no amount of alcohol that has been proven to be benign, the fact that individuals believe that there may be a harmless amount of alcohol to consume during pregnancy is a very concerning finding (Beckett, 2011). In a focus group study by Elek and colleagues (2013), women stated that they believed that some alcohol was less harmful to the developing fetus; specifically, wine was listed as being the least harmful by the women being interviewed. As some women still believe that some alcohol is less harmful than others, this demonstrates that individuals may not really understand the harms that alcohol may pose to the fetus or the mechanisms by which harms occur (Flak et al., 2014). Some of this confusion may come from the fact that doctors are also not particularly informed of the risks of drinking during pregnancy.

Medical practitioner knowledge. Approximately half of all the Canadian women included in the Environics Research Group Limited (2000) study, which polled men and women across Canada on their beliefs regarding alcohol consumption and FASD, believed that their doctor was the best source of information concerning the safety of alcohol consumption during the gestational period. The preference for information provided by medical professionals implies an implicit trust in the opinion of their doctors, but that trust may not be entirely warranted as a study by Crawford-Williams, Steen, Esterman, Fielder, and Mikocka-Walus (2015) uncovered the fact that general practitioners may provide limited or incorrect information to pregnant women. Crawford-Williams and colleagues (2015) found that South Australian women reported that they were provided with limited information regarding alcohol consumption during the gestational period. Often, the subject of alcohol consumption during the gestational period was broached during the initial appointment and consultation and then was never mentioned again (Crawford-Williams et al., 2015). Only discussing alcohol consumption during the first prenatal visit may indicate that medical professionals are not comfortable with the national guidelines of their country or they may assume that women already have a high level of knowledge regarding the risks of alcohol consumption during pregnancy.

The Current Study

The current study evaluated what women in Ontario know and believe about drinking during pregnancy. Additionally, the current study is an update to research conducted by Environics Research Limited on behalf of Health Canada (2000). The Environics Research Limited study (2000) polled 1,205 individuals including 902 women and 303 men between the ages of 18 and 40 from across Canada during the period of November 26 to December 9, 1999. The survey regarding knowledge of the risks of drinking during the gestational period was

available in English and French, both of Canada's official languages, in order to effectively capture Canada's population (EnviroNics Research Limited, 2000). The survey found that 66% of the Canadian sample knew that alcohol is harmful to the developing fetus, but there was a high level of confusion regarding what constitutes "safe" levels of alcohol exposure and the individuals polled were even more unsure regarding the safety of small amounts of alcohol. The study found that men, women from Quebec, and women who have greater alcohol consumption were more likely to believe that consuming alcohol during pregnancy was safe, and women with lower education tended to have less knowledge about the risks of alcohol consumption during pregnancy (EnviroNics Research Limited, 2000). These results point to several factors that influence knowledge on the risks of drinking during pregnancy, highlighting the need for further education and study in the area. In order to better tailor prevention strategies, it is important to understand more about which factors may influence a woman's likelihood to drink during pregnancy.

The objectives were to examine the following questions:

1. What do females over the age of 18 from Ontario know about drinking during pregnancy?
2. What factors influence perceptions of alcohol consumption during pregnancy?

Methods

This study employed a survey approach to collect information regarding women's health and knowledge of the risks of drinking during the gestational period. The survey was selected because it collects information regarding knowledge of various health related issues during the gestational period, including alcohol use.

Participants. Responses were collected from males and females across Canada, but for the purpose of this paper, the focus will be females from Ontario in order to improve the homogeneity of the sample. One-hundred and ninety-nine female participants from Ontario participated in this study. Participants were recruited at Laurentian University in Sudbury, Ontario, and using social media postings on popular social media sites such as Facebook, Twitter, and Tumblr. The mean age of the participants was 27.62 years ($SD = 8.94$). The majority of participants (77%) had at least some university education, the majority (53%) of participants indicated that they were currently students, 35% of participants had an annual household income of \$100,000, the majority of participants were in a dating or married relationship, and the large majority (96%) of participants were born in Canada (see Table 1).

Table 1: *Demographics*

Characteristic	Percentage
Education	
High school	10.6
Some college	1.5
College diploma/certificate	11.1
Some university	35.7
Bachelor's degree	15.1
Some graduate school	10.6
Graduate Degree	15.6
Employment	
Student	53.3
Full-time job	27.6
Part-time job	38.2
Retired	0.5
Home-maker	3
Unemployed	2
Income	
Under \$20, 000	14.8
\$20, 001 to \$40, 000	11.1
\$40, 001 to \$60, 000	10
\$60, 0001 to \$80, 000	12.2
\$80, 001 to \$100, 000	16.4
\$100, 000 and over	35.4
Marital Status	
Married	28.1
Cohabiting	15.6
Dating	16.6
Single	15.6
Widowed	0.5

Questionnaire. The survey (Environics Research Limited, 2000) titled “Knowledge of effects of gestational alcohol consumption and FASD in a Canadian sample” included several sections that are pertinent to the research questions of this study. The survey was available in both English and French. The survey began by collecting general information regarding knowledge of a number of health related issues during pregnancy (i.e., “Thinking about healthy infants and children, what, in your opinion are the most important things that pregnant women can do to increase the likelihood that their baby will be born healthy? What things come to mind

as important?"). After answering general questions regarding health behaviours during pregnancy (i.e., "Thinking about healthy infants and children, what, in your opinion, are the most important things that pregnant women can do to increase the likelihood that their baby will be born healthy?"), participants were asked specific questions regarding alcohol consumption during pregnancy (i.e., "In terms of its effect on a baby that is born, do you think it would be very safe, somewhat safe, not very safe, or not at all safe for a pregnant woman to drink each of the following amounts of alcohol?"). At the end of the survey, all participants were asked for their demographic information.

Procedure. Participants completed a self-guiding and confidential survey delivered in an online format. The online software contained security features and a variety of accessibility features ensuring that all participants were able to complete the survey. The survey consisted of close-ended and open-ended questions. Close-ended questions contained pre-coded responses and open-ended questions allowed participants to individualized their response and provide more detail.

Study data were collected and managed using REDCap electronic data capture tools hosted at Laurentian University (Harris et al., 2009). REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing an intuitive interface for validated data entry, audit trails for tracking data manipulation and export procedures, automated export procedures for seamless data downloads to common statistical packages, and procedures for importing data from external sources (Harris et al., 2009). REDcap and online recruitment was selected as these strategies provided access to a wide audience to be able to recruit a large sample of Ontarians. Participants were asked to read and complete an electronic consent form, which provided information on the study and had

contact information for the researchers and the ethics board at Laurentian University. After consenting to participate, participants were directed to the survey.

Results and Discussion

Results are organized according to the research questions posed in this paper. As such, women's general knowledge about drinking during pregnancy is first presented, then differences within the group are further explored. Summary and descriptive statistics (i.e., means, ranges, frequencies) along with statistical analyses were completed using the IBM SPSS Statistics 22 package.

Overall beliefs about alcohol consumption during pregnancy. When asked if it was important to reduce or cease alcohol consumption during pregnancy to increase the likelihood of having a healthy baby, 97% of participants indicated that it was important. This finding indicates that the vast majority of participants understand that decreasing alcohol consumption is important for the health of a developing fetus. When asked to indicate their level of support on a seven-point Likert scale ranging from one (not important at all to do) to seven (one of the most important things to do), 88.7% of participants rated cutting down or ceasing alcohol consumption during pregnancy to be one of the most important behaviours during the gestational period ($M = 6.86$, $SD = 0.41$). As the mean is above the midpoint of the scale, the majority of participants indicated that they believed that cutting down or ceasing alcohol consumption during pregnancy was important. Despite the fact that a majority of participants believed that cutting down on alcohol during the gestational period was important, over 10% of participants still felt that it was not extremely important to cut back on alcohol consumption.

Participants were also asked about pre-pregnancy behaviours, including alcohol use prior to conception and to what extent they believed that alcohol use before pregnancy could harm a

developing fetus. Approximately seventy-eight percent of participants believed that alcohol use would not harm a fetus or were unsure (see Table 2 for a full breakdown of the results). When participants were asked about small amounts of alcohol consumption during pregnancy, 40% of respondents indicated that they believed that a small amount of alcohol consumption during pregnancy could be considered safe or that they were unsure.

As shown in Table 2, 13% of participants were either unsure or felt that a moderate amount of alcohol consumption during pregnancy was safe, indicating that although the majority of participants felt that moderate alcohol consumption during the pregnancy was unsafe, the message is still not reaching over 10% of the sample. Finally, participants were asked if they believed that any alcohol consumption during pregnancy would harm a developing fetus. Thirty percent of participants either disagreed with the statement or were unsure, indicating a low level of knowledge in the sample.

Table 2: *Percentages of True/False Questions*

Statement	True	False	Unknown
Alcohol use before a pregnancy begins can harm a baby, even if a woman stops alcohol use during the pregnancy	21.1%	57.6%	21.2%
A small amount of alcohol use during pregnancy can usually be considered safe	30.7%	59.3%	10.1%
A moderate amount of alcohol consumption during pregnancy can usually be considered safe	5.0%	86.9%	8.0%
The more alcohol a pregnant women drinks, the more likely that the baby will be harmed	91.5%	7.5%	1.0%
Any alcohol consumption during pregnancy can harm the baby	69.8%	20.6%	9.5%

Participants were asked to rate their opinions on alcohol consumption during the gestational period on a 7-point Likert scale ranging from 1 (not safe at all) to 7 (very safe). Just under half of participants (41.8%) stated that they believed one or two alcoholic drinks during the pregnancy was considered safe and 13.3% stated they believed that it was very safe ($M = 2.98$, $SD = 2.15$). A majority of participants (60.3%) believed that two alcoholic drinks on two or three different occasions was safe, with the other 40% of participants reporting that they perceived alcohol use as at least somewhat safe ($M = 1.98$, $SD = 1.50$). Almost all participants (93.7%) agreed that three or four alcoholic drinks each weekend during the pregnancy was not safe at all ($M = 1.08$, $SD = 0.34$). Eighty-one percent of individuals indicated that they believed

that one alcoholic drink each day during pregnancy was not safe at all, with almost 20% of participants believing that it is at least somewhat safe ($M = 1.35$, $SD = 0.86$). As all of the means were below the midpoint of the scale, this indicates that the majority of participants believed that these behaviours were not safe. Despite the low means observed in these questions; as seen in Table 3, there are still some individuals who believe that consuming alcohol during the gestational period is safe.

In sum, the majority of participants did have some knowledge on the dangers of consuming alcohol during pregnancy. Despite finding that many women understand the risks of drinking during pregnancy, there was a portion of the sample that still did not believe that alcohol consumption during the gestational period was unsafe. Previous research has found that many women are not well informed about what constitutes a safe amount of alcohol for consumption during the gestational period (Elek et al., 2013; Environics Research Group Limited, 2000; Kesmodel & Kesmodel, 2002; Toutain, 2010). In the previous iteration of this study, it was found that 66% of the sample knew that alcohol was harmful to the developing fetus (Environics Research Group Limited, 2000). When asked about whether they believed that any alcohol was harmful to the developing fetus, 69.8% of the sample agreed that it was true. Though a fairly large portion of the sample believed that any alcohol was harmful during pregnancy, approximately 30% of the sample did not agree that any alcohol was harmful. Generally, results of the current study indicate that although the majority of participants are aware of the dangers of drinking during pregnancy, the message is still not reaching a substantial portion of the population. The discovery that many women still perceive some alcohol use during pregnancy as safe is concerning, as this belief is not a statement supported by fact (Beckett, 2011).

Though participants reported being the most certain that large and moderate amounts of alcohol consumed during pregnancy were unsafe, there was confusion about small amounts of alcohol consumption during pregnancy. This misperception in terms of low doses of alcohol being acceptable is a consistent finding in the literature. In a study of pregnant Danish women by Kesmodel and Kesmodel (2002), the authors found that 76% of women considered some alcohol consumption during pregnancy to be acceptable. In our sample, 40.7% of individuals indicated that they felt that a small amount of alcohol consumption was safe or that they were unsure if it was safe. Though this is a lower percentage than reported in the Kesmodel and Kesmodel (2002) study, this percentage still represents a large proportion of individuals who erroneously believe that alcohol use during pregnancy is safe. Additionally, the previous version of this study found that just over half (51%) of their sample believed that a small amount of alcohol can usually be considered safe (Environics Research Group Limited, 2000). The current findings represent a marked increase of just over 13% in the level of knowledge (46% disagreeing with the statement as opposed to 59.3% in the current sample), but there is still considerable confusion in regards to low levels of alcohol consumption. Although the literature does not provide consistent evidence for low doses of alcohol as being harmful to a developing fetus, this lack of evidence should not be taken as an indication that low doses of alcohol are safe (Henderson, Gray, & Brocklehurst, 2007).

Table 3: *Percentages and means for beliefs about alcohol*

Statement	1 (Not Safe at all)	2	3	4	5	6	7 (Very Safe)	Mean	SD
A total of one or two alcoholic drinks during the pregnancy?	43.9%	12.1%	9.6%	6.1%	9.1%	13.1%	6.1%	2.98	2.15
Two alcoholic drinks on two or three different occasions during the pregnancy?	63.3%	11.1%	10.6%	6%	5.5%	3%	0.5%	1.98	1.50
Three or four alcoholic drinks each weekend during the pregnancy?	95.4%	3.0%	1.5%	-	-	-	-	1.08	0.34
One alcoholic drink each day during pregnancy?	82.9%	8%	5%	3%	-	0.5%	0.5%	1.35	0.86

Group comparisons. Group comparisons, including age, level of education, marital status, intimate partner violence, income, and current drinking behaviours, were analyzed in regards to four main questions about participants' perceptions of safe alcohol consumption during the gestational period. These questions included: how safe one alcoholic drink during the pregnancy is; how safe three or four alcoholic drinks every weekend during the gestational period are; how safe one or two alcoholic drinks, on two or three different occasions, during the gestational period are; and how safe one or two alcoholic drinks during the gestational period are. Responses were reported on a 7-point Likert scale anchored at 1 (strongly disagree) and 7 (strongly agree). In order to compare groups, a series of one-way ANOVAs were conducted with follow up post-hoc testing as applicable.

ANOVAs were conducted to test for any mean differences within the sample. ANOVAs were selected because they are a robust test that allows for the detection of differences even in the presence of imperfect data (Norman, 2010). Though Likert data is truly ordinal, it is very common for Likert scale data to be analysed at the interval-level and analysed using tests such as ANOVAs (Boone & Boone, 2012). As this research is exploratory in nature, post-hoc testing was conducted on all analyses, significant or not, in order to further explore where differences in support may exist.

Age. Previous research has indicated that age may be an important factor related to level of knowledge of drinking during the gestational period (Environics Research Group Limited, 2000; Lange, Probst et al., 2015; Lange, Quere et al., 2015; McDonald et al, 2014). Women from the current sample were split into groups according to age at the 30 year mark. This age divide was exploratory in nature, but it was selected in order to attempt to capture the differences between the "young adult" population and older adults. In the present study, no mean differences

were found when comparing individuals under and over the age of 30 when it came to one alcohol drink during pregnancy ($F(1,196)= 2.84, p = .94$)¹, three or four alcohol drinks each weekend ($F(1,196)= 0.18, p = .09$)², two alcoholic drinks on two or three different occasions during the gestational period ($F(4,196)=0.65, p = .63$)³, and a total of one or two alcoholic drinks during the pregnancy ($F(1,195)=0.21, p = .65$).⁴ Exploratory post-hoc analyses, using an LSD test, further confirmed that there were no group differences based on age, as none of the mean differences between the age groups were significant. As previous research has found a relationship between age and drinking during pregnancy, Spearman's correlation were conducted (Elek et al., 2013). Spearman's rho was also not significant and there seems to be no discernable pattern of responding based on age.

The current findings from this study contradict previous research regarding age, which suggests that gestational drinking tends to increase with maternal age. Ethen and colleagues (2009) found that only 19% of women under 20 years of age reported consuming alcohol during the gestational period whereas 37.2% women 35 years of age or older reported engaging in this behaviour. Furthermore, these results were supported by Elek and colleagues (2013) who found that Black and Hispanic women aged 18 to 24 years were more likely to agree that any alcohol use during pregnancy was too much. Though the current results did not conform to results found in previous studies, such as Ethen and colleagues (2009) and Elek and colleagues (2013), this finding could be attributable to a number of methodological differences. Both Ethen and colleagues (2009) and Elek and colleagues (2013) were studies based in the United States and may not accurately reflect the social and political climate of Canada. The diagnostic guidelines

¹ Age was also tested at 10 year intervals and was still not significant ($F(4,196)= 0.83, p=.506$)

² Age was also tested at 10 year intervals and it was still not significant ($F(4,194)= 1.27, p=.29$)

³ Age was also tested at 10 year intervals and it was still not significant ($F(4,196)=0.65, p=.63$)

⁴ Age was also tested at 10 years intervals but remained not significant ($F(4,195)= 0.38, p=.82$)

are quite disparate, indicating that Canadians and Americans may not perceive FASD or alcohol consumption during the gestational period similarly (Cook et al, 2015; Hoyme et al, 2016). Furthermore, both of these studies utilized focus groups or questionnaires that were delivered over the phone, which does not reflect the methodology of the current study, which used an online survey method. Additionally, both Ethen and colleagues (2009) and Elek and colleagues (2013) had samples of women who had previously been pregnant or who were planning to become pregnant. As previous research has indicated that women who have previously given birth have less knowledge regarding the potential consequences of drinking during pregnancy than nulliparous women (Peadon et al., 2010). This sampling difference could have far reaching implications for the comparability of the results. The available Canadian literature indicates that younger age was associated with more binge drinking early in the pregnancy and low-moderate levels after pregnancy recognition (McDonald et al, 2014). Older age also tends to be correlated with more drinking during the gestational period (Lange, Probst et al., 2015; Lange, Quere et al., 2015). Though the samples are more socially and politically comparable, our results do not support these findings.

The results of the current study more closely align with previous research by Peadon and colleagues (2010), which was a national, computer assisted telephone survey of women from Australia. Results of the Peadon and colleagues study (2010) indicated that, although older women were less likely than younger women to know about the consequences of alcohol consumption during pregnancy, age was not a significant predictor of women's level of knowledge when other confounding variables were controlled for. Peadon and colleagues (2010) also utilized a similar methodology and their study was conducted in another commonwealth

country; as such, these results may be more comparable to the current findings than samples from the United States.

Level of education. No mean differences in endorsement were found for level of education for one alcoholic drink during pregnancy ($F(6,198)=1.44, p = .20$), three or four alcoholic beverages each weekend during the pregnancy ($F(6,196)=1.19, p = .32$), two alcoholic drinks on two or three different occasions during the gestational period ($F(6,198)=0.60, p = .73$), and one or two alcoholic drinks during the pregnancy ($F(6,197)=1.51, p = .18$).

Table 4: *Education level differences*

	One alcoholic drink each day			3 or 4 drinks each day			2 drinks on 2 or 3 occasions			A total of one or 2 drinks		
	<u>Mean</u>		<u>SD</u>	<u>Mean</u>		<u>SD</u>	<u>Mean</u>		<u>SD</u>	<u>Mean</u>		<u>SD</u>
Completed high school	1.19	*C	0.68	1.05	-	0.05	1.52	-	1.03	1.9	*CG **F	1.41
Some community college	1.00	-	0.00	1.00	-	0.00	1.67	-	1.16	3.00	-	1.73
Diploma or certificate from a college	1.73	*ADG	1.7	1.00	*F	0.00	2.14	-	1.75	3.29	*A	2.35
Some university	1.21	*C	0.53	1.08	-	0.32	2.00	-	1.44	2.80	-	2.10
Completed University	1.4	-	0.85	1.03	-	0.18	1.7	-	1.26	2.67	-	1.12
Some graduate Education	1.52	-	0.92 8	1.19	*CG	0.60	2.14	-	1.82	3.67	**A	2.30 9
Completed Graduate school	1.23	*C	0.67	1.00	*F	0.00	1.84	-	1.39	3.10	-	2.15

A=Completed High School, B=Some Community College, C=Diploma or Certificate from a College, D=Some University, E=Completed University, F= Some Graduate Education, G= Completed Graduate School

* $p < 0.05$ ** $p < 0.01$

Higher scores indicate higher endorsement of the statements

Exploratory post-hoc testing using an LSD revealed some significant mean differences between the groups as seen in Table 4, though the omnibus tests were not significant. There were significant differences in terms of level of education for the question regarding “one alcoholic drink each day during pregnancy.” These differences indicate that individuals who have a certificate or diploma are more likely to endorse having one alcoholic drink every day than their counterparts with only a high school education, individuals with a certificate or diploma are more likely to endorse drinking one alcoholic drink every day than their counterparts with some university education, and individuals with a diploma or certificate are more likely to endorse drinking one alcoholic drink per day during the gestational period than their counterparts with a graduate or professional degree.

For “three or four alcoholic drinks each weekend during the pregnancy,” an LSD test revealed significant differences indicating that individuals who have completed some graduate or professional school are more likely to endorse drinking three or four drinks each weekend during the pregnancy, and individuals who had completed graduate school were less likely to endorse drinking three or four alcoholic drinks each weekend during the pregnancy than their counterparts who only had some graduate education.

For “a total of one or two alcoholic drinks during the pregnancy,” an LSD revealed significant mean differences indicating that individuals who have a certificate or diploma were more likely to endorse drinking a total of one or two alcoholic drinks during the entire gestational period than their counterparts who had completed high school. Individuals with some graduate or professional education were more likely to endorse drinking a total of one or two alcoholic drinks during the pregnancy than their counterparts who had completed high school, and individuals with a graduate or professional degree were more likely to endorse drinking than

individuals who only have a high school education. There were no other mean differences observed for other questions and Spearman's correlations were not significant.

All of the significant mean differences, save for two, indicated that individuals with higher education were more likely to endorse drinking during the gestational period. This finding is in line with previous research that has indicated that women with higher education are at a higher risk for using alcohol during the gestational period. Ethen and colleagues (2009) discovered that the use of any alcohol consumption during pregnancy increased alongside years of education. In their study, it was found that 20.1% of women with less than 12 years of education and 37.1% of women with 16 or more years of education reported consuming alcohol during their pregnancies (Ethen et al., 2009). The outcomes discovered by Ethen and colleagues (2009) echo the findings of the current study, which indicate that women with more education were more likely to indicate that they endorse drinking behaviours during the gestational period. Though, unlike the study by Ethen and colleagues (2009), all of our participants had 12 or more years of education; for the most part, more years of education resulted in more drinking behaviour endorsement.

Previous research has also found that individuals with higher levels of education are more likely to know about the effects of drinking alcohol during the gestational period. Peadon and colleagues (2010) found that women who had completed a bachelor's degree or higher were more likely than those women with only a high school degree to know that alcohol can result in FASD. This knowledge may explain the current study's finding that individuals with more education were less likely to endorse drinking behaviours for two of the questions examined. The uncertainty in the literature and conflicting findings of the current study point to a need for more

study of the effect of education on endorsement of drinking behaviour during the gestational period.

Marital status. There were no mean differences in terms of marital status for believing that one alcoholic drink each day during pregnancy was safe ($F(3,197)= 0.563, p = .64$), believing that three or four alcoholic beverages each weekend during the pregnancy was safe ($F(3,195)= 2.27, p = .08$), believing that two alcoholic drinks on two or three different occasions during the gestational period was safe ($F(3,197)=.758, p = .52$), or believing that a total of one or two alcoholic drinks during the pregnancy was safe ($F(3,196)= 0.72, p = .54$). Exploratory post-hoc tests using an LSD revealed that there was a significant mean difference ($p = .044$) between individuals who were married ($M = 1.00, SD = .00$) and those who were single ($M = 1.11, SD = .39$) when examining their endorsement of the safety of drinking three or four alcoholic drinks each weekend during the pregnancy. There were no other significant mean differences.

The finding that single women were more likely to endorse drinking during pregnancy is very surprising as there is a fair amount of literature which indicates that a woman's drinking habits are influenced by her partner. Chang, Mcnamara, Orav, and Wilkins-Haug (2006) found that partners' scores on tests related to knowledge about the risks of during pregnancy were predictive of their female partners' scores. Walker and colleagues (2011) found that Canadian women were twice as likely to drink during pregnancy if they had partners. Although they found that simply having a partner resulted in an increase in the likelihood of drinking during pregnancy, Walker and colleagues (2011) did not collect data on the actual drinking habits of the partner, so it was not possible to study the link between maternal and paternal drinking further. Though previous research has indicated there is a link between partner habits and maternal

drinking during the gestational period, it is difficult to draw a direct comparison due to differences in the methodology and the samples included in various studies.

Though there does seem to be strong support in the literature for the deleterious effect of partners' alcohol consumption on women's drinking habits, there is some disagreement within previous research. In a study investigating the predictive nature of knowledge on the risk of drinking during pregnancy, the results of Chang and colleagues (2006) revealed that partner alcohol consumption was not predictive of prenatal alcohol consumption. The previous study by Environics Research Group Limited (2000) found that many women said that they would not be influenced by their partner's encouragements to drink during the gestational period. Conversely, it was discovered that women aged 18 to 24, women with more education, and women who already drank more were more likely to be influenced by their partners to drink during the gestational period (Environics Research Group Limited, 2000). Additionally, Elek and colleagues (2013) found that a woman's partner could either be a strong supporter or detractor of a woman's choice not to drink during pregnancy.

Intimate partner violence experience. Participants could indicate their intimate partner violence (IPV) status by indicating yes or no on the survey. Participants were also given the option of indicating that they would prefer not to disclose their IPV status. In order to facilitate meaningful analysis of the data, individuals who chose not to indicate their IPV status were not included in the analysis ($n = 6$). There were no significant differences in terms of intimate partner violence experiences ($F(1,190) = 2.71, p = .12$) when looking at the responses to whether individuals believed that one alcoholic drink each day during pregnancy was safe; whether participants thought three or four alcoholic beverages each weekend during the pregnancy was safe ($F(1,188) = 0.666, p = .42$); whether participants thought that two alcoholic drinks on two or

three different occasions during the gestational period was safe ($F(1,190)= 0.99, p = .32$); and whether participants thought that a total of one or two alcoholic drinks during the pregnancy was safe ($F(1,189)= 1.86, p = .17$). Though it was not significant, the means tended to indicate that women who were survivors of IPV endorsed drinking behaviours less for all questions.

The current study found that there was no mean difference between intimate partner violence (IPV) status on endorsement of the safety of drinking behaviour, which is quite surprising as the results do not conform to previous literature. It was found that experiencing IPV during pregnancy tended to correlate with increased substance abuse during pregnancy (Fanslow, Silva, Robinson, & Whitehead, 2008). Though it was not a significant finding, Fanslow and colleagues (2008) found that women who experienced IPV during pregnancy had higher incidences of drinking during pregnancy (31%) than women who did not experience IPV (20%). Additionally, being exposed to interpersonal violence in childhood or in previous relationships tended to be correlated with drinking before and after pregnancy recognition (Choi et al., 2014). Yen and colleagues (2012) also found that experiencing IPV was significantly associated with drinking after the recognition of pregnancy in a sample of Indigenous pregnant women in Taiwan. As the current results did not conform to expectations based on the previous literature available, this indicates that further study of the link between IPV and endorsement of the safety of drinking behaviours is necessary.

Income. There were no mean differences when looking at the responses to whether individuals believed that one alcoholic drink during pregnancy was safe based on income ($F(10, 188)=1.01, p = .44$). When looking at whether participants thought three or four alcoholic beverages each weekend during the pregnancy was safe, there were differences in income approaching significance ($F(10, 186)=1.90, p = .06$), but the assumption of homogeneity of

variance was violated ($F=7.90, p<.001$).⁵ There were no mean differences when looking at whether participants thought that two alcoholic drinks on two or three different occasions during the gestational period was safe (*Welch's F* (10, 44.54) = 1.64, $p = .13$). Finally, when looking at participants' responses to whether they thought that a total of one or two alcoholic drinks during the pregnancy was safe, there was no difference in terms of income ($F(10, 187) = 1.3, p = .34$).

Because the ANOVAs were not significant, a Spearman's rank-order correlation was run to determine the relationship between income and endorsement of drinking during the gestational period. There was a very weak, negative correlation between income and endorsing drinking three or four alcoholic drinks during each weekend during the pregnancy, which approached statistical significance ($r_s = -.134, p = .068$). This finding indicates that, although it is not significant at a conventional level, there seems to be a trend whereby people with higher incomes are less likely to endorse the safety of the drinking behaviour. There was a very weak, negative correlation between income and endorsing drinking two alcohol drinks on two or three different occasions during the pregnancy, which was statistically significant ($r_s = -.179, p = .014$). This finding indicates that people with higher incomes were less likely to endorse the safety of drinking behaviour.

Based on the results of the correlations, the current data seem to indicate that, generally, people with higher incomes are less likely to endorse the safety of drinking behaviours. This finding does not fit with previous literature, as studies such as Ethen and colleagues (2009) found that the use of alcohol during the gestational period increased from 21.1% of women with household incomes of less than \$10,000 to 39.8% of women with incomes over \$50,000.

⁵ Homogeneity of variance assumes that all groups have similar variance. Normally, a Welch's ANOVA would be conducted, but this was not possible due to low cell counts for some levels of the IV.

Similarly, Chang and colleagues (2006) found that women with a higher income tended to drink more frequently while pregnant. Furthermore, even among low income Latinas, it was found that higher income was associated with more alcohol consumption during the gestational period (Chambers et al., 2005). The disconnect between the current findings and the previous research could be due to methodology or the Ontarian sample used in the current study, but this discrepancy warrants further investigation as results from the previous use of the same questionnaire revealed that women with the lowest income levels were less likely to mention alcohol cessation as an important factor for prenatal health (Environics Research Group Limited, 2000).

Drinks per week. First, there was no difference in self-reported number of drinks per week consumed by the participants for belief that one alcoholic drink during pregnancy was safe, (*Welch's* $F(5,31.94)=0.66, p = .66$), three or four alcoholic beverages each weekend during the pregnancy was safe (*Welch's* $F(5, 30,31)=1.11, p = .37$), but two alcoholic drinks on two or three different occasions during the gestational period was significant ($F(5,197)=4.14, p = .001$). LSD post-hoc tests revealed that the 15 or more drinks per week group was different than all other groups ($p<.001$) with all other groups having means of approximately 1.6 to 1.9 and the 15+ group having a mean number of drinks per week of 4.33. This finding indicates that the individuals who drank 15 or more drinks per week were more likely to endorse drinking as being safe. Finally, when looking at participants' responses to whether they thought that a total of one or two alcoholic drinks during the pregnancy was safe, there was no difference in terms of drinks per week consumed by the participants ($F(5,191)=1.33, p = .25$).

In order to determine if there was any relationship, a Spearman's rank-order correlation was run to determine the relationship between number of drinks per week and endorsement of

the safety of drinking during the gestational period. There was a very weak, positive correlation between number of drinks per week and endorsing drinking three or four alcoholic drinks during each weekend during the pregnancy, which was statistically significant ($r_s = .179, p = .012$). No other correlations were significant.

Women who consume more drinks per week were more likely to believe that alcohol consumption during the gestational period is safe. This finding is in line with previous research. For example, Chang and colleagues (2006)'s results indicated that alcohol consumption prior to pregnancy was a predictor of drinks per day during early pregnancy. The findings of Chang and colleagues' (2006) study are similar to the findings of our study, highlighting that women who drink more prior to conception tend to drink more during their actual pregnancy. Additionally, Peadon and colleagues (2010) found that women who drank five or more days per week and who drank seven or more drinks per day were more likely to endorse drinking behaviour during the gestational period. These findings echo the current results that women who reported drinking more often in our sample were also more likely to endorse drinking during the gestational period. Additionally, Environics Research Group (2000) found that women who have greater alcohol consumption were more likely to believe that consuming alcohol during pregnancy was safe.

Conclusion

In summary, the current study found that, although women self-report being fairly well informed about the dangers of drinking during the gestational period, the message that no alcohol consumption during pregnancy is the safest option is still not reaching all women of childbearing age. Results were mixed in terms of the effect of level of education on endorsement of the safety of drinking behaviours during the gestational period. Because the effects of level of education are unclear, there is a need for future research as to how education can impact beliefs on the

safety of alcohol consumption during pregnancy. Single women were more likely to endorse the safety of drinking during the gestational period in this sample, which indicates that future study is needed to better understand the relationship between partners on drinking during the gestational period. The current findings also echo the lack of consensus on the effect of partners on drinking habits in the literature. More research is also necessary to fully understand the relationship between IPV, as well as income. The results of the current study were not clear in respects to these variables or did not conform to previous literature in the area.

The current study had several limitations, chiefly the fact that the study employed a self-report of intended behaviour. As the survey used in this research was self-report, socially undesirable behaviours such as drinking during pregnancy and IPV may have been underreported due to a socially desirable bias (Davis, Thake, & Vilhena, 2010). In a previous study that also used self-report to measure alcohol consumption behaviours, it was found that individuals who were high impression managers reported 33% less consumption and were 50% less likely to report risky behaviours (Davis et al., 2010). As individuals were more likely to underreport their level of consumption and harms, this finding indicates that socially desirable responding poses a threat to the validity of self-reported measures of alcohol use and harm (Davis et al., 2010). In order to combat socially desirable responding, the survey was anonymous and the consent form did remind participants about of this confidentiality. The study only asked participants about their intended behaviour, which may not be an accurate reflection of their behaviour in reality.

Additionally, there are limitations to the representativeness of this sample. As can be seen in the demographics section, the participants were mostly university educated with a high annual household income. This sample may not be representative of the population of Ontario and may not represent the opinions of individuals who were not university educated or who have a lower

socioeconomic status. Future studies should focus on recruiting a more diverse, representative sample of Ontarians that includes more individuals without university educations or who come from lower socioeconomic statuses. Future studies should also seek to recruit a nationally representative sample in order to better represent the Canadian experience. Future studies should also seek to find a measure of actual behaviour rather than intentioned behaviour.

Future research should seek to fill the gaps and inconsistencies found in the current study. Additionally, future research should seek to create and evaluate interventions based on the information garnered in this study. Specifically, interventions should seek to target groups identified as having the highest agreement with statements; namely women with higher education, no partners, higher incomes, and more general alcohol consumption. As such, colleges and universities may be a key area to target as many students tend to fit some or all of these parameters. Ideally, intervention would occur before women reach childbearing age in elementary and high school health classes to further eliminate the risks of alcohol-exposed pregnancies in young mothers and those women who do not attend post-secondary education.

This study has important implications regarding education for childbearing aged women as well as medical professionals. Childbearing aged women should be educated about the risks of drinking during the gestational period. Women who were identified in the current study as being more likely to endorse drinking during the gestational period (i.e., women with higher education, no partners, higher incomes, and higher levels of alcohol consumption) should be targeted for education programs that stress the fact that there is no undisputed safe amount of alcohol for consumption during pregnancy. Women should also be educated on the risks and lack of evidence of safety on low levels of alcohol consumption as the current study, and previous literature, has consistently reported confusion in regards to low level alcohol consumption

(Environics Research Group, 2000; Henderson, Gray, & Brocklehurst, 2007). With appropriate education, future cases of FASD could be prevented.

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Chapter 3

**Where Women from Ontario Receive their Information Regarding Drinking During
Pregnancy**

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Where Women from Ontario Receive their Information Regarding Drinking During Pregnancy

Alcohol can cause harm to society when it is consumed by women during the period of fetal development, leading to FASD (Popova & Chambers, 2014). It is important to understand where women are receiving their information regarding alcohol consumption during pregnancy as FASD is the most common nonhereditary cause of intellectual disability (Kapasi & Brown, 2017) and a better understanding could lead to more effective prevention campaigns.

Fetal Alcohol Spectrum Disorder

Fetal Alcohol Spectrum Disorder (FASD) is a congenital, chronic condition caused by alcohol consumption during the gestational period that is present at birth and persists well into adulthood (Temple, Ives, & Lindsay, 2015). Symptoms of FASD can include growth deficiencies, facial anomalies, skeletal deformities, speech and language deficits, motor dysfunctions, lifelong learning and behavioural difficulties, and sleeping and eating irregularities (Chudley et al., 2005; Cook et al., 2015; Walker, Fisher, Sherman, Wybrecht, & Kyndely, 2005). FASD was first formally described by Jones and Smith in 1973, giving medical professionals a name for the constellation of symptoms caused by drinking during pregnancy.

Medical Practitioner Knowledge

In a study conducted by the Environics Research Group Limited (2000), approximately half of Canadian women surveyed believed that their doctor was the best source of information regarding the risks of consuming alcohol during pregnancy. The fact that a large proportion of participants preferred to receive information from a medical professional indicates that people tend to trust the accuracy and legitimacy of information that comes from their doctor; however, research demonstrates that this trust may be misguided as some general practitioners provide

misguided information to expectant mothers (Coons, Clement, & Watson, *in press*; Crawford-Williams, Steen, Esterman, Fielder, & Mikocka-Walus, 2015; Inonue, Entwistle, Wolf-Branigin, & Wolf-Branigin, 2017; Senecky et al., 2011).

It has been found repeatedly throughout the literature that approximately 1 in every 10 healthcare professionals report that alcohol consumption as safe (Anderson et al., 2010; Coons et al., *in press*; Inonue et al., 2017). Although 1 in 10 seems fairly small, the impact of these misinformed clinicians is fairly extensive as that one healthcare provider may influence multiple patients, leading to an exponential spread of misinformation. Women in a South Australian sample report that alcohol consumption was discussed by their doctor or midwife on the first appointment and then never again (Crawford-Williams et al., 2015), which could indicate a lack of comfort with the Australian guidelines regarding drinking during the gestational period and could indicate a lack of education for medical professionals in the area. In further support of this possible lack of familiarity and comfort with the guidelines regarding drinking during the gestational period, medical professionals report a perceived lack of consensus in the medical media leading to conflicting advice being given to medical professionals and laypeople alike (Mukherjee, Wray, Curfs, & Hollins 2015). Additionally, in a sample of medical professionals from Ontario, 44.2% of medical professionals reported receiving information regarding FASD from the media leaving them vulnerable to believing the same misinformation as women of childbearing age (Coons et al, *in press*).

FASD and Media

Research findings have indicated that many people lack knowledge regarding alcohol consumption during pregnancy and do not feel comfortable breaching the subject of drinking during pregnancy with others and, for that reason, alternate approaches to speaking with peers

and medical professionals have been suggested to disseminate knowledge (Burgoyne, Willet, Armstrong, Best Start Resource Centre, Environics Research Group, 2006; Kyskan & Moore, 2005; Lowe, Baxter, Hirokawa, Pearce, & Peterson, 2010). In 2004, Ontario launched their first province-wide campaign, the “Be Safe” campaign, focusing on the prevention of prenatal alcohol exposure (Burgoyne, et al., 2006). The “Be Safe” campaign, which utilized ads in malls, on busses, in print, on the radio, and on television was designed to target women of childbearing age and to inform them that there is no safe amount or time to drink during pregnancy (Burgoyne et al., 2006). Evaluation of the program demonstrated that the campaign was successful in bringing awareness to topics regarding alcohol use during pregnancy to women of childbearing age as there was a significant increase in the women’s awareness of the dangers of drinking during the gestational period at post-test (Burgoyne et al., 2006). A study by France and colleagues (2014) also found that their media-based program was effective at increasing women’s intentions to abstain from drinking alcohol during pregnancy. France and colleagues (2014) discovered that messages were the most effective when they combined a threat with a self-efficacy message, which involved a friend who provided support to the pregnant women and framed the abstinence from alcohol as a health choice. The self-efficacy approach was more positive and increased confidence in one’s ability to change a given behaviour (France et al., 2014).

Though media campaigns can have a positive impact on knowledge of the risks of drinking during pregnancy, the media can also have a deleterious effect. When celebrities or non-experts speak about healthcare issues they may not present an accurate picture of the science (Larson, Cooper, Eskola, Katz, & Ratzan, 2011; Williams, 2011). British actress Rachel Weisz proclaimed that it was safe to drink wine after the first trimester, causing quite a stir in the world of FASD prevention (Connolly-Ahern & Broadway, 2008). As an actress, Rachel Weisz is

probably not qualified to give medical advice to her fans and the fact that her message was repeated by news and popular media indicates that stories featured in these types of information sources may not always be reliable. The fact that people would get their advice from Rachel Weisz is an example of the fallacy of the appeal to authority as she uses her recognition to present her opinion as fact to the population (Goodwin, 2011).

In a review of news stories published about FASD over a ten year period, it was found that people were likely to encounter information about FASD in three main types of stories: health features, special interest stories, and public safety news (Connolly-Ahern & Broadway, 2008). Though the news stories tended to offer advice to women on avoiding FASD, they frequently added to the confusion as the “experts” quoted often offered contradictory information (Connolly-Ahern & Broadway, 2008). For example, the international print and television news media recently reported on a study that claimed that it was safe to drink up to 1.5 servings of alcohol if a woman was at least 3 months pregnant (Williams, 2011). What the news failed to report was that the methodology utilized retrospective reports and did not “prove” that alcohol consumption was safe (Williams, 2011). As memory is not infallible, there are issues with retrospective reports as women may not fully remember their drinking patterns or may underreport stigmatizing behaviours (Williams, 2011).

In addition to news media being inaccurate, pregnancy advice books can sometimes present advice regarding alcohol that is conflicting, inaccurate or not based in fact (Raymond, Beer, Glazebrook, & Sayal, 2009; Tierney, 2005). Along with inaccurate news media and pregnancy advice books, people are increasingly turning to the internet for advice regarding pregnancy and alcohol consumption (Tierney, 2005). There are plenty of internet sources that are

very informative, but many others are not; and both may be used by women looking for information (Di Pietro, Whiteley, Mizgalewicz, & Illes, 2013; Tierney, 2005).

The Current Study

The aim of this study was to examine where women of childbearing age in Ontario receive their information about the risks of alcohol consumption during pregnancy.

The objectives were to examine the following questions:

1. Where do females over the age of 18 get their information about the risks of consuming alcohol during the gestational period?
2. What are differences among participants in support for warning labels informing Canadians about the risks of drinking during the gestational period?

Methodology

This study employed a survey approach in which participants were presented with the questionnaire originally developed by the Environics Research Group Limited (2000). The previously developed survey was selected as it asked questions regarding where individuals have seen information about the risks associated with drinking alcohol during pregnancy.

The survey was managed by REDCap (Research Electronic Data Capture) hosted at Laurentian University (Harris et al., 2009). REDCap is a secure, web-based application designed to support data capture for research studies, providing an intuitive interface for validated data entry, audit trails for tracking data manipulation and export procedures, automated export procedures for seamless data downloads to common statistical packages, and procedures for importing data from external sources (Harris et al., 2009). Recruitment through social media and

online data collection through REDCap was selected as it allowed the researchers to reach a wide audience and recruit a large sample.

The survey employed in this study was selected as it was available in both English and French and included several sections that pertained to the research questions. After answering questions related to their opinions on drinking during the gestational period (e.g., In terms of its effect on a baby that is born, do you think it would be very safe, somewhat safe, not very safe, or not at all safe for a pregnant woman to drink each of the following amounts of alcohol?), participants were asked questions about where they had received information regarding alcohol consumption during pregnancy (e.g., Do you recall seeing any information about the effects of alcohol use on a baby during pregnancy?). Participants were also asked about their support of risk advertisements on alcohol products (e.g., Do you strongly approve, somewhat approve, somewhat disapprove, or strongly disapprove with each of the following: Requiring labels on alcohol products warning about the risks of alcohol use during pregnancy?). All participants were asked for their demographic information at the end of the survey.

Participants. Though this paper only focuses on females from Ontario to allow for a more homogenous sample in terms of location and sex, data were collected from males and females nationwide. Participants in this study included 199 females from Ontario, Canada. Participants were recruited from Laurentian University located in Northern Ontario, as well as through social media sources such as Reddit, Facebook, and Twitter. The mean age of the participants was 27.62 years ($SD = 8.94$). The majority of participants (77%) had at least some university education and indicated that they were currently students (53%). 35% of participants had an annual household income of \$100,000 (see Table 1 for full demographic results). Most

participants reported being in a dating, cohabitating, or married relationship (60%), and were born in Canada (96%).

Table 1: Demographic information

Characteristic	Percentage
Education	
High school	10.6
Some college	1.5
College diploma/certificate	11.1
Some university	35.7
Bachelor's degree	15.1
Some graduate school	10.6
Graduate Degree	15.6
Employment	
Student	53.3
Full-time job	27.6
Part-time job	38.2
Retired	0.5
Home-maker	3
Unemployed	2
Income	
Under \$20, 000	14.8
\$20, 001 to \$40, 000	11.1
\$40, 001 to \$60, 000	10
\$60, 001 to \$80, 000	12.2
\$80, 001 to \$100, 000	16.4
\$100, 000 and over	35.4
Marital Status	
Married	28.1
Cohabitating	15.6
Dating	16.6
Single	15.6
Widowed	0.5

Results

Participants were presented with a self-guiding, confidential survey hosted on an online platform that had a variety of accessibility and security features ensuring that everyone could participate securely. The survey consisted of close-ended questions that contained pre-coded responses and open-ended questions, which allowed participants to individualize their answers

and provide more detailed responses. Descriptive and summary analysis along with ANOVAs were conducted using the IBM SPSS Statistics 22 package.

Information sources. When asked, 87.8% of participants indicated that they recalled seeing information about the effects of alcohol use during pregnancy. Following up on this question, participants were asked to indicate where they had seen the information. Upon examining individual information sources, there was some variation in source popularity (see Table 2). The three most popular information sources were media programs/newspaper articles/magazine articles (60% of participants), brochures and pamphlets (59.8% of participants), and posters (58.3% of participants). These findings regarding source popularity indicate that the most seen and remembered sources have been print and popular media. The three least popular information sources were presentations and seminars, with 17.6% of participants indicating that they had seen information in this source, infant care groups and classes with 16% of respondents indicating that they had seen information from this source, and radio with only 11.1% of participants indicating that they had heard information about drinking during pregnancy from this source. The low ratings on these three sources indicate that the least seen and remembered sources of information include aural media and special settings that participants have to seek out themselves such as seminars.

Table 2: *Where participants saw information regarding FASD and gestational drinking*

Source	Selected
Media programs/articles in newspapers/ magazines	60.8%
Brochure/pamphlet	59.8%
Poster	58.3%
Doctor/Health care providers	50.3%
Personal experience/word of mouth	45.7%
Internet	45.7%
Television Advertising	39.2%
School/ special classes (i.e. CPR classes)	38.7%
Alcohol bottles/vendors	34.2%
Magazine advertising	25.6%
Books	20.6%
Work	19.6%
Presentation/seminar	17.6%
Infant care group/classes	16.1%
Radio	11.1%

In addition to identifying where participants had seen information about alcohol use during pregnancy, participants were also asked to indicate where they would prefer to receive such information. There was considerable variation in participants' indicated preferences (see Table 3). The three most preferred sources were a doctor or doctor's office (97%), health clinics and hospitals (87.9%), and Health Canada (77.4%). These findings indicate strong support for the idea that participants want their information about the risks of drinking during pregnancy to come from medical authorities in their communities.

The three least preferred information sources were other media (14.6%), newspapers (10.6%) and the workplace (8.5%). These low ratings indicate that participants do not want to receive information from traditional media or their workplace, perhaps believing that these are not authoritative sources of information regarding alcohol consumption during the gestational period.

Table 3: *Best sources of information on drinking during the gestational period*

Source	Selected
Doctor/doctor's office	97%
Health clinic/hospital	87.9%
Health Canada	77.4%
Public health organizations/programs	70.9%
Pre-natal class	67.3%
Pharmacy/drug store	36.7%
Library/school	30.7%
TV programs/advertisements	23.1%
Through friends/family	19.6%
Other media	14.6%
Newspapers	10.6%
Workplace	8.5%

Despite the indicated preference for receiving information from a medical authority, only 28.4% of participants stated that they had actually spoken to a medical professional about alcohol consumption during the gestational period. This very low number of participants inquiring with their medical professional means that over 70% of our sample was left gathering their information from less informed sources, such as popular media. As shown in Table 4, 30.4% of participants who did ask a medical professional about alcohol consumption during pregnancy did not receive a clear answer from their medical professional. Although 69.6% of participants received information indicating that there was no proven safe amount of alcohol consumption if they are or may be pregnant, almost a third of participants were not given a clear answer, potentially placing them at an increased risk to continue consuming alcohol during pregnancy.

Table 4: *Medical advice received by participants*

Medical Advice	Percentage
There was no safe amount of alcohol if I might be pregnant	44.3%
There was no safe amount of alcohol if I know I am pregnant	25.3%
There was no clear answer	30.4%

Labeling. Participants were also asked to rate their support for labels and signage on various products, such as bottle and cans of alcohol as well as in various settings, on a 7-point Likert scale anchored at 1 (strongly disapprove) and 7 (strongly approve). As highlighted in Table 5, overall participants were very supportive of all labels and signage. Government-sponsored advertising describing the risks of alcohol consumption during pregnancy was the most endorsed ($M = 6.36$, $SD = 1.09$). Though it was the least supported item, requiring signs in restaurants describing the risks of alcohol consumption during pregnancy was still endorsed ($M = 5.45$, $SD = 1.76$) indicating that women may feel as though signage in restaurants about the risks of alcohol consumption during pregnancy is warranted. Generally, participants greatly agreed with signs in all settings and labels on all products presented to them.

Table 5: Support for labels advertising the risks of drinking during pregnancy

Label Type	1 (Strongly Disapprove)	2	3	4	5	6	7 (Strongly Approve)	Mean	SD
Government-sponsored advertising describing the effects warning about the risks of alcohol use during pregnancy	0.5%	1%	0.5%	6.6%	7.6%	18.7%	65.2%	6.36	1.09
Requiring messages on alcohol advertising warning about the risks of alcohol use during pregnancy	2.1%	1.6%	3.1%	12.5%	9.9%	18.2%	52.6%	5.92	1.48
Requiring labels on alcohol products warning about the risks of alcohol use during pregnancy	1.5%	2.5%	4.5%	13.1%	11.1%	14.1%	53%	5.84	1.53
Requiring signs in bars and clubs warning about the risks of alcohol use during pregnancy	2.0%	4.1%	5.6%	11.2%	13.3%	12.2%	51.5%	5.72	1.64
Requiring signs in restaurants warning about the risks of alcohol use during pregnancy	3.5%	5.1%	5.6%	16.2%	12.1%	13.6%	43.9%	5.45	1.76

Group differences. In terms of group differences, there was a significant difference in support for government-sponsored advertisements describing the risk of drinking during pregnancy (*Welch's F* (1, 84.7) = 3.95, $p = 0.05$), with individuals under 30 being more likely to endorse having government labels and signage warning about the effects of alcohol on a developing fetus ($M = 6.49$, $SD = .89$) compared to those over 30 ($M = 6.1$, $SD = 1.41$). There were no other significant mean differences in support of labels and signage. Spearman's correlations were also run to test the relationship between age, income, number of drinks per week, intimate partner violence status, and urban versus rural living situation and support for labeling; there were no significant differences. The lack of significant differences indicates that our data was not able to further clarify where differences in support may come from.

In sum, participants were most likely to remember seeing information from print and media sources, such as newspapers and brochures, and were least likely to remember information from aural sources, such as seminars. Participants were most likely to indicate that they would prefer their information to come from a medical authority, particularly a doctor or professional in a hospital setting. Conversely, participants indicated that they would least like to receive information from media sources and their workplaces. Despite the desire for medical advice, very few individuals had actually followed through and spoken to a medical professional, and those who did may not have received the soundest advice. All participants indicated their support for labels and signage regarding alcohol consumption during pregnancy and, more specifically, participants under the age of 30 were more likely to support government-sponsored messages regarding the dangers of alcohol consumption during the gestational period.

Discussion

Overall, it was found that many women remember seeing information concerning FASD in print and popular media. Though it seems promising that many women recall seeing information regarding the dangers of drinking during pregnancy, previous research indicates that just seeing the information may not be sufficient to influence behaviour as the information presented may be stigmatizing or framed poorly (e.g., Women may be shamed for their choice to drink during the gestational period and the media may use terms such as ‘appalling mothers’, ‘losers’, ‘idiots’ and ‘selfish’; Chambers et al., 2005; Eguiagaray, Scholz, & Giorgi, 2016) rendering them ineffective. In a study of low socioeconomic status pregnant Latina women, it was found that women who reported drinking alcohol during pregnancy were more likely to be aware of universal warnings vis-à-vis alcohol and pregnancy and were more likely to have knowledge of Fetal Alcohol Syndrome (Chambers et al., 2005). Additionally, in a study of Native American, African American, and Caucasian women in urban California, it was found that women continued to drink despite being exposed to prevention messages (Kaskutas, 2000). The high level of knowledge among drinkers indicates that just seeing information about drinking during pregnancy is not enough to halt the behaviour and may indicate that other factors are at play when it comes to preventing drinking during the gestational period. The type of framing may be important as conflicting frameworks and messaging regarding responsibility and blame can confuse women when they are trying to make decisions about the safety of alcohol consumption during the gestational period (Di Pietro et al., 2013; Eguiagaray et al, 2016; Raymond et al., 2009; Tierny, 2005). When consuming media regarding FASD and the risks of drinking during pregnancy, women may receive negatively framed advice placing blame on many different parties including expectant mothers, medical professionals, and the government

(Eguigary et al., 2016). As blaming and shaming each of these individual pillars fails to realize the complexity of the causes of FASD (Eguigary et al., 2016), future public health campaigns should seek to engage all of the individual players in FASD prevention in a positive way.

As between 58 and 60% of participants in the current sample indicated that they had seen their information in popular and print media, this may help to explain why, despite widespread knowledge and information concerning the risks of drinking during pregnancy, some women continue to drink, as demonstrated by Chambers and colleagues (2005). Though some popular print media sources, such as pregnancy advice books (which many women trust as information sources regarding pregnancy), offer accurate information about prenatal health, many of these books avoid the topic of alcohol consumption during the pregnancy or offer erroneous and dangerous advice (e.g., *Pregnancy for Dummies* (2004) only advises women to avoid alcohol during the first trimester; Di Pietro et al., 2013; Eguigary et al., 2016; Raymond et al., 2009; Tierny, 2005). News and popular media also tend to offer advice not based in evidence, for example a season 7 episode of the popular sitcom "*How I Met Your Mother*" presented a pregnant character drinking wine after her doctor informed her that a little bit of drinking during the gestational period was fine (Kang & Fryman, 2011). The motives of the news media are not malicious, but the presentation of many different frameworks and stories may lead to confusion as women are bombarded with differing opinions and advice from "experts" (Connolly-Ahern & Broadway, 2008; Eguigary et al., 2016). As these were the sources where the large majority of participants in our sample indicated receiving their information, the current results could point to the inadequacy of current efforts to educate the public about the potential effects of drinking alcohol during the gestational period and highlight the need for more evidence-based prevention campaigns.

In terms of the most preferred information sources, the overwhelming majority (97%) of participants indicated that the best source of information would be their doctor or doctor's office. Though many women report a preference for receiving their information regarding the risks of consuming alcohol during the gestational period, many healthcare professionals do not feel it is their responsibility to provide this information (Coons et al., *in press*). A recent study by Coons and colleagues (*in press*) found that though 87.9% of participants agreed that no alcohol was recommended, some physicians still gave other advice to patients, which occasionally included a perceived safe amount of alcohol. Physicians in the sample were also unsure of the definition of "in moderation," highlighting some of the confusion that medical professionals experience while trying to counsel patients regarding FASD (Coons et al., *in press*). This misperception indicates that medical professionals may not be prepared to address alcohol use during pregnancy or to support women who are currently pregnant in stopping alcohol consumption (Coons, Watson, Yantzi, Lightfoot, & Laroque, 2017; Coons et al., *in press*). Coons and colleagues (*in press*) also found that over a quarter of the physicians included in their sample believed that diagnosing FASD was outside of their professional role. Most concerning, 16% of paediatricians and 24.5% of family doctors, two groups that would be most heavily involved with diagnosing FASD, indicated that making a diagnosis was outside of the scope of their practice (Coons et al., *in press*). The findings that the vast majority of childbearing-aged women want to receive information from their doctors and that many physicians do not feel that it is their responsibility or that they are prepared to deal with issues related to FASD are in direct conflict. This discrepancy points to a disconnect between the public and the medical profession, and uncovers a potential gap in medical education and training. This gap in medical education is highlighted further by the finding that, of those women who did speak to their doctors, almost a third

(30.4%) were not given a clear, informed answer. Future studies should examine exactly what information women of childbearing age want from their doctors, what information they are currently receiving, and where medical professionals are gaining their information regarding FASD.

Overall, all women were extremely supportive of requiring labels and signage warnings about the potential effects of drinking alcohol during pregnancy. Women were most supportive of government-sponsored advertising, which was reflected in their rating of government agencies, such as Health Canada, as preferred information sources. Generally, it seems that all women endorsed the use of labels and signage regarding alcohol use during the gestational period as there were no differences in support based on income, current number of drinks per week, intimate partner violence history, or living situation. There does seem to be a significant difference in endorsement for government-sponsored advertisements describing the risk of drinking during the gestation period, with individuals under 30 years of age indicating more support for government labels compared to those over 30 years of age. This finding indicates that there may be a difference between how older and younger women like to receive their information about alcohol consumption and who the information should be coming from. Future research should seek to further explore this age difference in support for labeling, and should examine which information dissemination strategies are best for women of varying ages.

There seems to be a high level of support for warning labels and advertisements regarding alcohol in the current study and the previous literature, but evidence for labeling is limited (Thomas, Gonneau, Poole, & Cook, 2014). A literature review by Thomas and colleagues (2014) found that labels do not change the drinking behaviours of heavy or binge drinkers, but they do have an impact on low-risk drinkers. Despite the lack of evidence that these interventions

actually lead to changes in judgements and values, research has indicated that these labels can encourage women to start a conversation with their healthcare professionals (Thomas et al., 2014). Messaging employed in these labels is extremely important and research indicates that the messages used should be clear, consistent, and avoid blaming the women (Bell, Zizzo, & Racine, 2015; Thomas et al., 2014). Some Canadian campaigns such as the “No alcohol during pregnancy: we can all help prevent FASD” campaign in the Northwest Territories, and the “This is our baby” campaign in Yukon have strived to use supportive messaging (Bell et al., 2015). The success of these Canadian campaigns may help to explain why Canadian women are so supportive of labels despite the fact that many provinces such as Alberta and B.C. do not have mandatory labeling policies (Giesbrecht & Wettlaufer, 2013; Thompson, Stockwell, Vallance, Giesbrecht, & Wettlaufer, 2013; Vallance, Thompson, Stockwell, Giesbrecht, & Wettlaufer, 2013). Unlike Alberta or B.C., Ontario does have mandatory signage laws (Giesbrecht & Wettlaufer, 2013). Specifically, Ontario has Sandy’s Law, which requires all bars, restaurants, and retail outlets that serve alcohol to prominently display an 8x10 inch sign that clearly states a warning message about the potential harms of drinking during pregnancy (Giesbrecht & Wettlaufer, 2013; Wettlaufer, Cukier, & Griesbrecht, 2017). As Ontario already has mandatory warning labels and the sample from which this data was collected shows that a substantial portion of women still support drinking during the gestational period (Zidenberg & Watson, 2017), this indicates that warning labels as they are currently implemented may not be completely effective.

Limitations

The current study had several limitations, which should be considered when interpreting the results of this study. Limitations include the self-report nature of the survey, which may

cause some issues related to socially desirable responding. In order to combat socially desirable responding, the survey was anonymous and the consent form reminded participants of this confidentiality. Additionally, there are limitations to the representativeness of this sample. As can be seen in the demographics section, the participants were mostly university educated with a high annual household income. These demographics may not be representative of the population of Ontario or Canada as a whole, and may not represent the opinions of individuals who were not university educated or who have a lower socioeconomic status.

Future Directions

Future research should seek to recruit a more provincially representative sample that better reflects the socioeconomic makeup of Ontario. Future research should also be sure to design questionnaires, interviews, and focus groups to include questions that address the gaps identified by the current study in order to best address prevention campaigns (e.g., future researchers should be sure to ask if women had spoken to a medical professional about the risks of drinking during the gestational period, and exactly what that information was). Future prevention campaigns should strive to address the potential disconnect between medical professionals and the general public, and should examine what information women actually want and need from their healthcare professional. Finally, future prevention campaigns and research should further examine the efficacy of current labels and signage, and should aim to create a more effective strategy for prevention using this medium.

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Chapter 4: Conclusion

The purpose of this thesis was to contribute to the extant literature regarding what childbearing-aged women know about drinking during the gestational period and, furthermore, where women are receiving prenatal health advice. The current thesis adds to the literature by providing up-to-date statistics regarding what women in Ontario know about drinking during pregnancy. The current thesis also presents information on the sources where women are getting information regarding drinking, and where they would like to receive their information; data which is virtually non-existent in the existing literature for women from Ontario specifically. In this chapter the results from both studies are presented and discussed. After a discussion of the results, the chapter concludes with a discussion of the limitations of the studies and recommendations for future research.

Summary of Findings

As this thesis was manuscript based, the analysis was separated into two distinct manuscripts. The first manuscript details what women from Ontario know about drinking during pregnancy and the second explores where women receive their prenatal health advice. The findings of each manuscript are discussed in further detail below.

Article one. The first article titled “Knowledge and Risk Factors for Support of Drinking during the Gestation Period in Women from Ontario” presented results from a survey designed to examine what child-bearing aged women from Ontario know about drinking during the gestational period. Understanding what individuals know about drinking during pregnancy is important as previous research has shown that factors such as age (Elek et al., 2013; Ethen et al., 2009; Peadon et al., 2013), level of education (Ethen et al., 2013; Peadon et al., 2010), marital status (Chang, Mcnamara, Orav, & Wilkins-Haug, 2006; Elek et al., 2013; Walker, Fisher,

Sherman, Wybrecht, & Kyndely, 2011), and income (Chang et al., 2006; Chambers et al., 2005; Ethen et al., 2009) can either increase or decrease the likelihood of supporting drinking during the gestational period. The survey employed in this study was originally developed by Environics Research Group Limited (2000) for use in research conducted on behalf of Health Canada. The original study polled 1,202 women ($n=902$) and men ($n=303$) between the ages of 18 and 40 across Canada (Environics Research Group Limited, 2000). The current study updated the research methodology used in 2000 by using social media recruitment as opposed to telephone interviews. Additionally the current thesis used an online version of the questionnaire housed on REDCap (Research Electronic Data Capture) hosted at Laurentian University (Harris et al., 2009). As it offers a high level of anonymity, REDCap was selected as online data collection tool. An update to the methodology was deemed necessary as the data presented in Environics Research Group Limited (2000) was 17 years old and used telephone polling to recruit participants, which is not frequently used in modern research. As social media and the internet are more prevalent in modern culture, they were used to recruit participants with a focus on younger Canadians. Results were analysed using descriptive statistics—such as mean and percentages—along with inferential tests such as ANOVAs, LSD post-hoc tests, and Spearman's correlations.

Results indicated that while the majority of respondents agreed that drinking during pregnancy was not safe, there is still a small percentage of respondents who believed that drinking during the gestational period was not harmful. Previous studies have found similar results; women are unsure what constitutes a safe amount of alcohol for consumption (Elek et al., 2013; Environics Research Group Limited, 2000; Kesmodel & Kesmodel, 2002; Toutain, 2010). Seventeen years ago, in 2000, 66% of the sample knew that alcohol was harmful to the

developing fetus (Environics Research Group Limited, 2000). Though 69.8% of the current sample agreed that any alcohol could harm the developing fetus, a 3.8% increase in knowledge over the past 17 years, approximately 30% of the sample did not agree that alcohol was harmful to the fetus. The finding that some women still believe that alcohol consumption is safe is very concerning as there is currently no evidence regarding a safe amount of alcohol for consumption during pregnancy (Flak et al., 2014).

Group differences based on demographics. Some differences based on demographic factors were observed in the sample. Specifically, there were no significant differences based on age; meaning that all age groups were equally as likely to endorse drinking behaviours. Although there is no consensus on the effect of age on drinking behaviour, a growing body of literature indicates support for drinking and maternal age are positively correlated, meaning that support for drinking during the gestational period tends to increase along with maternal age (Elek et al., 2013; Ethen et al., 2009). The results of this thesis seem to align more with findings by researchers such as Peadon and colleagues (2010), who found that age is not a significant predictor when other variables were accounted for. The differences in these findings could be attributable to many factors such as the methodology—our study used surveys while studies by Ethen and colleagues (2009), as well as Elek and colleagues (2013), focused more on qualitative methods. Additionally, the sample used in both of the aforementioned studies exclusively included women who had previously given birth, whereas our sample included all women of child bearing age regardless of their birth histories. This difference in sample could have a large impact as previous research has indicated that women who have previously given birth know less about the potential risks of drinking during pregnancy than their nulliparous—never having given birth—counterparts (Peadon et al., 2010).

Both Ethen and colleagues (2009) and Elek and colleagues (2011) studied U.S. samples, which may not accurately reflect the social and political climate of Canada. Peadon (2013) used a sample of Australian women and, as Australia is also part of the British Commonwealth, the women included in the sample may be more reflective of the Canadian population. The differences regarding FASD in Canada and the US are exemplified in the diagnostic and clinical guidelines of both countries (Cook et al, 2015; Hoyme et al, 2016). In their 2015 update to the Canadian clinical guidelines regarding FASD, Cook and colleagues included all of the previous possible diagnoses into one label: FASD. The updated American guidelines preserved the original diagnoses and did not opt to collapse all diagnoses into the label of FASD (Hoyme et al., 2016). These differences in the categorization and diagnosis of FASD in Canada and the United States point to a possible difference in the perception and classification of FASD in these countries. The differences between Canadian and American were further supported as there were differences in the long-term effects of alcohol warning labels between the U.S. and Canadian samples (Greenfield, Graves, & Kaskutas, 1999). Individuals in the U.S. were more likely to remember seeing warning labels if they were heavy drinkers or aged 18-29, whereas there were no demographic differences in the sample from Ontario (Greenfield et al., 1999). Additionally, individuals from the U.S. were more likely to remember the messages on the warning labels than those from Ontario, but there was an increase in accurate recall over time in Ontario but not in the U.S. (Greenfield et al., 1999). Additionally, Kairouz and Greenfield (2007) also found that there were differences based on country for gender, level of education, and contextual alcohol intake. Engs, Hanson, Gliksman, and Smythe (1990) also found that, although Americans had similar consumption rates to those in Canada, Americans reported more problems related to drinking as compared to their Canadian counterparts. Though both of the studies comparing

these results are close to 20 years old, there have been very few studies that directly compare Canadian and U.S. samples. Though aged, these results give us the best idea of the differences between Canadian and U.S. culture and further reinforce the idea that there may be a difference in how the two populations view alcohol.

Results in terms of level of education were mixed, with the majority of the results indicating that participants with higher education were more likely to endorse drinking behaviour, and few indicating that women with less education were more likely to endorse drinking behaviour. After a one-way ANOVA revealed no significant mean differences between the groups, an LSD post-hoc test was run to further explore the relationship between education and endorsement of drinking behaviours. This analytic strategy, often termed fishing or “researcher degrees of freedom” could lead to a false positive (Simmons, Nelson, & Simonsohn, 2011). When searching for statistical significance using multiple analyses, the likelihood of producing a falsely positive finding at the 5% level increases and is greater than 5% (Simmons et al., 2011). This study is exploratory and we intended to be absolutely sure that there were no differences for the aforementioned variable, therefore our findings are not conclusive and are only intended to point to this variable as a future avenue for research. Cautions in interpreting the results notwithstanding, the findings of this thesis are in line with previous research which has supported the finding that women with higher education were more likely to endorse drinking behaviour (Ethen et al., 2009; Peadon et al., 2010). Conflicted results were also evident in the data generated from the current thesis with some participants with a bachelor’s degree being more likely to know that alcohol can result in FASD than women with only a high school education (Peadon et al., 2010). The mixed nature of these findings indicated a need for future research into the area.

The results of the current study revealed that single women were more likely to endorse drinking than women who were married. This finding is surprising as previous research has indicated that simply having a partner was enough to increase the likelihood of drinking during the gestational period (Walker et al., 2011). Additionally, it was found that a woman's attitudes about drinking could be influenced by their partners (Chang et al., 2006). Though there is a large body of literature that supports drinking having a deleterious effect, there are some studies that indicate that partner alcohol consumption was not actually predictive of the behaviour of the women during the gestational period (Chang et al., 2006). The results of Chang and colleagues (2006) may not be directly comparable to the current results as the study only included couples, whereas our sample was 15% single. The lack of consensus in the already established literature and the multiple comparisons used to find significance point to marital status as being an important avenue for future research. As 15.6% of the participants in the current sample were single, the individuals included in the sample might be different from previous studies which have included mostly couples who were pregnant or who had recently given birth.

In terms of IPV survivor status, there were no mean differences between the groups but trends indicated that women who were survivors of IPV were less likely to endorse drinking behaviours than those who were not survivors of IPV using an exploratory post-hoc LSD test. The results of this study—both the lack of mean difference and the finding that women who had experienced IPV were less likely to endorse drinking during the gestational period—are not in line with previous findings. Previous research indicates that women who had experienced IPV were more likely to endorse drinking during the gestational period (Choi et al., 2014; Fanslow, Silva, Robinson, & Whitehead, 2008; Yen et al., 2012). As the current results contravene previous findings and were based on multiple comparisons, the current findings indicates that

future research should examine the implications of intimate partner violence on attitudes towards drinking during the gestational period. Though there are no previous studies that support the findings from this survey, research on IPV in general may provide some clues. Pan, Neidig, and O'Leary (1994) found that having a lower income increased the odds that a woman would experience mild or severe IPV in their relationship. As 35.4% of the participants in the current sample have an income of \$100,000 or more, the individuals experiencing IPV in the sample might be different from typical survivors of IPV.

In terms of level of income, a very weak negative correlation was found using a Spearman's correlation, which indicated that women with lower incomes were more likely to endorse drinking during the gestational period. The current results are not supported by the previous literature, where it has been documented that women with higher incomes were more likely to drink during the gestational period (Chambers et al., 2005; Chang et al., 2006; Ethen et al., 2009; Magnus et al., 2014). The differences between our results and previous research may be due to a multitude of reasons, including methodological differences or cultural differences between the Canadian and American samples. The differences between the current findings and the lack of mean difference indicates that level of income may be an important area to research further. The finding that women with higher incomes were more likely to endorse drinking during the gestational period has important implications for prevention efforts. Specifically, this knowledge regarding income can help to design selective prevention of maternal alcohol abuse campaigns which target women with higher income levels, perhaps by targeting women who live in more affluent neighbourhoods (Hankin, 2002). Thurmeier, Deshpande, Lavack, Agrey, and Cismaru (2010) called for further education for individuals with higher education, so it is possible that recent prevention campaigns have successfully targeted higher income women to

the detriment of lower income women. Though targeting certain groups makes public health prevention campaigns more manageable, the mixed nature of the results related to income highlight the importance of universal prevention campaigns (Hankin, 2002). As there seems to be no clear answer regarding which income bracket is more likely to support drinking during pregnancy, a strategy that targets the broad public may be more efficient in preventing new cases of FASD (Hankin, 2002).

Finally, in terms of number of drinks per week, the results of this study indicated that women who consume more drinks per week were more likely to believe that alcohol consumption during pregnancy was safe. These findings are in line with previous research that indicates that women who consume more alcohol on average were more likely to endorse drinking during the gestational period (Chang et al., 2006; Peardon et al, 2010). Additionally, the results of the study that first used the survey employed in the current research also indicated that women who have a greater level of alcohol consumption were more likely to believe that alcohol consumption during the gestational period was safe or that they were more likely to report a belief in safety for various reasons (Environics Research Group Limited, 2000). As our results were analogous to previous research and were highly comparable to research carried out 17 years ago, this indicated that there has been no discernable change in support for drinking behaviour among women who have higher levels of alcohol consumption over time. As Chang and colleagues (2006) found that alcohol consumption in the period immediately prior to the pregnancy was predictive of drinks per day in the pregnancy, it is particularly concerning that there seems to be no reduction in support for drinking behaviour over the past 17 years. The fact that there was no change in the past 17 years indicates that women who consume a large amount of alcohol may not be getting the education and prevention messages, or that the messages may

not be effective for them leading to a call for further education and prevention efforts in this population. Public health awareness campaigns, such as warning labels and stories in the media, may not be effective for these women as these campaigns may blame the mother and fail to recognize the complex systemic and social factors that may influence a woman to drink (Bell, Zizzo, & Racine, 2015; Eguiagaray, Scholz, & Giorgi, 2016). The blame and shame imparted by these campaigns can actually discourage a woman from disclosing her alcohol use to her medical professional, meaning that she cannot access appropriate interventions (Bell et al., 2015; Eguiagaray et al., 2016). In order to best reach women with higher levels of drinking, media campaigns should avoid the shame framework and should seek to provide information without blaming any one party (Eguiagaray et al., 2016).

Article two. The second article titled “Where Women from Ontario Receive Their Information Regarding Drinking during the Gestational Period” focused on where child-bearing aged women from Ontario are getting their information regarding alcohol consumption during pregnancy and their perceptions of these information sources. Discovering where individuals are receiving their information is important as not all information sources are created equally, and some sources can have a negative effect or provide misinformation (Connolly-Ahern & Broadway, 2008; Tierny, 2005; Williams, 2011). The survey employed in this study was originally developed by Environics Research Group Limited (2000) for use in research conducted on behalf of Health Canada.

Results of this article indicated that most women recalled seeing information and the most recalled source types were print and popular media. Though many women indicated that they had seen messages about drinking during pregnancy, previous research indicates that knowing that alcohol can be harmful and seeing the messages may not be enough, as these

messages may be stigmatizing or poorly framed (i.e., mothers of children with FASD may be shamed for their choice to drink during the gestational period and the media may use disparaging terms to describe these women; Chambers et al., 2005; Eguigary et al., 2016). Future studies should seek to further test and explain how women view advertisements and how they affect decisions made by the women. Print and popular media choices, despite being the most widely remembered source, may not be the best source of information as news media, print sources such as pregnancy advice books, and popular media may not offer factual advice on drinking during the gestational period (Connolly-Ahern & Broadway, 2008; Tierny, 2005). Women indicated that they believed that the best source of information about drinking during the gestational period was their doctor or doctor's office. Despite women believing that their doctor should be their source of information, research shows that many doctors do not feel that diagnosing FASD was part of their professional responsibilities (Coons et al., *in press*). When women in our sample did speak to their doctor, almost a third (30.4%) were not given a clear, informed answer. We did not collect specifics on what that advice was, so we are unable to further examine what information women were being given.

Finally, all women were extremely supportive of having labels and advertising that warns of the dangers of drinking during pregnancy. The only significant group difference in support of labeling and advertising, was that women under 30 had a higher mean support score for government-sponsored labels than those over 30. This significant difference could indicate a difference in how women of different ages would prefer to receive their information. Very few studies have examined age in relation to support of labeling, but Balachova and colleagues (2014) report that young women who are at-risk drinkers may benefit from labels tailored to their needs. Specifically, women aged 30 to 44 were less likely to rely on peers or family, and were

more likely to rely on their education, research data, and on the recommendations of medical professionals when making decisions regarding the risks of drinking during pregnancy (Balachova et al., 2014). In light of these findings, it may be beneficial for women over the age of 30 to see labels that present a strong, concrete message that involves research or a message from a medical professional. As the very limited literature suggests that younger women may benefit more from labels in general, it may explain why younger women in the present study were more likely to support interventions relative to their age group.

As almost a third of women in the current sample (34.2%) reported seeing messages on alcohol bottles or in venues that serve alcohol, and many women are still supportive of alcohol consumption during the gestational period (Zidenberg & Watson, 2017), it is clear that simply seeing information on labels is not sufficient to change behaviours. Simply seeing labels is not sufficient in changing behaviours, since there may be other factors—such as the framing of the prevention message—at play. When the framing of the prevention message places the blame solely on the woman, this can lead to shame in a pregnant woman and can actually prevent her from seeking help or advice regarding drinking (Equigaray et al., 2016). Additionally, conflicting messages that place the blame on a variety of parties can confuse women as they attempt to make decisions regarding alcohol consumption during the gestational period (Di Pietro, Whiteley, Mizaglewicz, & Illes, 2013; Eguiagaray et al, 2016; Raymond, Beer, Glazebrook, & Sayal, 2009; Tierny, 2005). Rather than placing blame on individual players (such as medical professionals, government, or medical professionals) public health practitioners should strive to create more holistic campaigns that address the reasons women drink during pregnancy and should impugning the decisions of women.

Limitations and Recommendations for Future Research

The current study had several limitations, first among them being that it collected information regarding self-reported behaviour on very stigmatizing topics. Due to the self-report nature of the questionnaire used, socially undesirable behaviours (i.e., drinking during pregnancy and IPV) may have been underreported due to socially desirable responding (Davis, Thake, & Vilhena, 2010). In a previous study of self-reported alcohol consumption behaviours, it was found that individuals who were high impression managers reported 33% less consumption and were 50% less likely to report risky behaviours (Davis et al., 2010). As individuals were more likely to underreport their level of consumption and harms, this finding indicates that socially desirable responding poses a threat to the validity of self-reported measures of alcohol use and harm (Davis et al., 2010). In an attempt to reduce socially desirable responding, the respondents were reminded that their responses were completely anonymous and would not be identifiable. A study by Joinson (1999) indicated that when participants were anonymous and completed web-based measures, participants showed the lowest levels of socially desirable responding. As the current study was anonymous and conducted online, measures were taken to attempt to reduce socially desirable responding, but future studies should continue to attempt to minimize socially desirable responding and should further explore the effect this responding bias may have on data. Future research could use vignettes that depict situations in which a woman drinks during pregnancy. Vignettes have been shown to help reduce socially desirable responding and bias, as participants are able to take on the role of a character in the vignette and separate themselves from the stigma attached to the behaviour (Hughes & Huby, 2002). Vignettes may also allow for the representation and consideration of the social context in which the behaviour is couched, providing a more complete picture of the behaviour (Hughes & Huby, 2002).

Additionally, the sample recruited may not be representative of the Canadian or Ontarian population. Participants included in this sample were mostly university educated and they had a high annual household income. As previous research, and the current study, indicate that women with higher education are less likely to support drinking during the gestational period (Ethen et al., 2009) this may have a profound impact on the findings of this study. Additionally, the literature seems to indicate that individuals with lower incomes are less likely to drink during the gestational period (Chambers et al., 2005; Chang et al., 2006). As the majority of the women in our sample had relatively high household incomes, we may not have captured the attitudes of women with lower incomes. Additionally, though internet-based measures do assist with socially desirable responding, the use of internet based measures excludes individuals who do not have access to a computer or reliable internet. Individuals with disabilities, including individuals with a diagnosis of FASD, may be at particular risk for not seeing advertisements or participating in the study as the survey was hosted online, which may result in a lack of access and accessibility (Chadwich, Wesson, & Fullwood, 2013; Leo, Zitzelsberger, Zidenberg, & Edwards, 2017). In a study of a social media program for youth with and without disabilities, Leo and colleagues (2017) found that only 31% of participants reported having access to a computer, tablet, or mobile device. Additionally, participants reported accessibility issues, which presented a barrier for social media use (Leo et al., 2017). In addition to the survey being hosted online, social media was used as the main recruitment tool in this study. As individuals with disabilities may be excluded from seeing the advertisement and participating in the survey due to lack of access to technology, we may be missing out on valuable information provided by individuals who have disabilities. Further research should seek to recruit a more representative sample and should seek

to use various recruitment and surveying strategies to better capture the experiences of all Canadians.

Implications

This study helps to address the growing body of literature on what individuals know about the risks of drinking during the gestational period in Canada. Understanding what women know about alcohol and reproductive health is extremely important as it helps inform prevention practices for FASD in Canada. Information gained in this study will help to inform public health prevention campaigns at the local, provincial, and federal level. The knowledge gained from this thesis has already been disseminated to various professionals as it has been presented at conferences aimed at professionals and academics, and it will be published in peer-reviewed journals to further propagate the knowledge gained from this thesis in the public and professional arena, specifically the public health and academic domains. Additionally, the information gained in this thesis will help medical professionals further understand what women from Ontario know about drinking during the gestational period and to help identify certain variables that may place women at risk for drinking during the gestational period. As this study recruited participants from a university and used social media as a recruitment tool, the results of this thesis may be of particular interest to university health clinics. In order to further disseminate the results of this thesis, copies will be made available to the Laurentian University health clinic. Having more modules regarding FASD and disability added to the continuing education curriculum for medical professionals will also be explored.

These results have important implications for public health campaigns as we identify important gaps in women's current knowledge of drinking during the gestational period. The women identified in this study as having the highest level of endorsement (i.e., women with

higher education, no partners, higher incomes, and more general alcohol consumption) should be targeted for further education and intervention. Though these women should be paid special attention, public health campaigns should attempt to inform as many people as possible about the risks of drinking alcohol during pregnancy and should not favour one group to the detriment of others. Public health campaigns should also attempt to avoid placing blame or using stigmatizing messages as they may confuse women as they try to make sense of the conflicting information they receive regarding drinking during pregnancy (Eguiagaray et al., 2016).

As FASD is the most common nonhereditary cause of intellectual disability (Kapasi & Brown, 2017) and estimates for 2013 place the total cost of FASD to Canadian society at somewhere between \$1.3 billion and \$2.3 billion annually (Popova, Lange, Burd, & Rehm, 2015), preventing FASD is very important to Canadian society. The information gained in this thesis contributes to the prevention of FASD, as it provides more information about what women from Ontario know about drinking during pregnancy and where they are getting their information in 2017. This information will help public health, medical, and research professionals to understand what women from Ontario currently know and to apply this information to their current practices. Public health officials can use this information to make more effective campaigns that are tailored to where women are lacking information and where they want to receive their information from. Furthermore, medical professionals can use the information from this thesis to help counsel their pregnant and child-bearing aged patients, and to clear up any misconceptions about credible sources from which to receive information regarding drinking during pregnancy. Finally, individuals in the research and academic community can use the current research to learn what women currently know and to generate future studies that further test and explore these concepts. Researchers can also learn from the

strengths and weaknesses of this study and use them to create more efficient future research (e.g., consider the use of vignettes to reduce socially desirable responding).

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Appendix A

**APPROVAL FOR CONDUCTING RESEARCH INVOLVING HUMAN SUBJECTS**

Research Ethics Board – Laurentian University

This letter confirms that the research project identified below has successfully passed the ethics review by the Laurentian University Research Ethics Board (REB). Your ethics approval date, other milestone dates, and any special conditions for your project are indicated below.

TYPE OF APPROVAL / <input checked="" type="checkbox"/> New X / <input type="checkbox"/> Modifications to project / <input type="checkbox"/> Time extension	
Name of Principal Investigator and school/department	Alexandra Zidenberg, supervisor, Shelley Watson, Psychology
Title of Project	Knowledge of effects of gestational alcohol consumption and FASD in a Canadian sample
REB file number	2015-10-23
Date of original approval of project	February 01, 2016
Date of approval of project modifications or extension (if applicable)	
Final/Interim report due on: (You may request an extension)	February, 2017
Conditions placed on project	

During the course of your research, no deviations from, or changes to, the protocol, recruitment or consent forms may be initiated without prior written approval from the REB. If you wish to modify your research project, please refer to the Research Ethics website to complete the appropriate REB form.

All projects must submit a report to REB at least once per year. If involvement with human participants continues for longer than one year (e.g. you have not completed the objectives of the study and have not yet terminated contact with the participants, except for feedback of final results to participants), you must request an extension using the appropriate LU REB form. In all cases, please ensure that your research complies with Tri-Council Policy Statement (TCPS). Also please quote your REB file number on all future correspondence with the REB office.

Congratulations and best wishes in conducting your research.

Rosanna Langer, PHD, Chair, *Laurentian University Research Ethics Board*