

Fetal Alcohol Spectrum Disorders (FASD)
Exposure Rates,
Primary and Cascade Results of In Utero Alcohol Exposure,
and Incidence Markers.

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*T*here are two ways to live your life.
One is as though nothing is a miracle.
The other is as though everything is a miracle.

Albert Einstein (1879-1955)

FASlink Fetal Alcohol Disorders Society

Fetal Alcohol Spectrum Disorders (FASD)

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Objective:	5
The Method	5
Background	6
Conclusions	6
Summary of Exposure Rates	7
Table 1 Summary of Prenatal Exposure Rates - 2001	7
Exposure Rates	8
Calculations	8
Table 2 Females Who Drink Beverage Alcohol And Those Who Do Not.	9
Table 3 Females Who Binge Drink 5 Or More Drinks Per Occasion	10
Table 4 Females Who Drink 1 To 4 Drinks Per Occasion	11
Table 5 ²⁶ Frequency of drinking 5 or more drinks on one occasion in the last 12 months, by age group and sex, household population aged 12 and over who are current drinkers, Canada, 2000/01	12
Table 6 ²⁷ Canada Live Births	14
Table 7 ²⁸ Annual Demographic Statistics 2001	15
Table 8 Drink/Weight Index Chart	16
Results of Prenatal Alcohol Exposure	18
Table 9 Institute of Medicine diagnostic criteria for fetal alcohol syndrome and alcohol-related effects	19
Table 10 Comparison of the effects of drugs on prenatal development	21
Table 11 Vulnerabilities Time Chart	22
Primary disabilities	23
Secondary Disabilities	23
Genetics	24
Premature Death - medical, accidental, suicide, violence	24
Serotonin	24
Dopamine	24
Brain malformation	25
Frontal Lobes	25
Table 12 Executive Functions	26
Corpus Callosum	26
Hippocampus	27
Hypothalamus	27
Cerebellum	27
Basal Ganglia	28
Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD)	28

	3
Cancer	28
Heart.....	28
Diabetes insipidus	28
Schizophrenia.....	28
Immune system suppression / malfunctioning	28
Brain Aneurysm.....	28
Agitation	28
Central auditory processing disorder (CAPD).....	28
Cognitive perseveration (over-focusing)	28
Autism.....	29
Asperger syndrome	30
Developmental delay / PDD (pervasive development disorder)	30
Developmental speech and language disorder.....	30
Depression	30
Cerebral palsy	30
Complex seizure disorder.....	31
Tourette Syndrome.....	31
Developmental coordination disorder.....	31
Dyslexia.....	31
Echolalia.....	31
Extreme impulsiveness	31
Sensory integration problems	31
Little or no retained memory	31
Loss of intellectual functioning (IQ).....	31
Emotional maturity far below chronological age	31
Under normal height and weight	31
Failure to thrive.....	31
Swallowing/Feeding problems	32
Microcephaly	32
Facial anomalies	32
Vision problems.....	32
Speech impediments.....	32
Deafness / Hearing problems.....	32
Slack muscles	32
Limb and palmar (simian) crease abnormalities	33
Spinal dimple.....	33
Spina Bifida	33
Hair growth on back of neck.....	33
Pigeon Chest.....	33
Concave chest.....	33

	4
Genital deformities	33
Undescended testicle(s).....	33
Hernia.....	33
Kidney and liver defects	33
Highly Concrete thinking	33
Abstract concept difficulties.....	33
High level of verbal skills may mask low level of understanding.....	33
Little or no capacity for interpersonal empathy	34
Little or no capacity for moral judgment	34
Early drinking.....	34
Addiction.....	34
Fight or Flight	34
Sexuality	35
High risk behaviour.....	35
Employment problems.....	35
Inability to live independently	35
Over-trusting, Easily misled.....	35
Behavioural Problems	35
Other Central Nervous System symptoms.....	36
Incidence	38
Education System.....	39
Conclusions.....	42
The Author.....	43
References:.....	44

Objective: To estimate the incidence of FASD

Fetal Alcohol Spectrum Disorders (FASD), Fetal Alcohol Syndrome (FAS), Fetal Alcohol Effects (FAE), Partial Fetal Alcohol Syndrome (pFAS), Alcohol Related Neurodevelopmental Disorders (ARND), Alcohol Related Birth Defects (ARBD) and Static Encephalopathy Alcohol Exposed are all names for a spectrum of disorders caused when a pregnant woman consumes alcohol.

An individual's place, and success, is almost entirely determined by neurological functioning. The largest cause of brain injury in children is prenatal alcohol exposure. Often the neurological damage goes undiagnosed, but not unpunished. This major health issue creates enormous personal, family, social, educational, social service and justice consequences.

Prenatal alcohol exposure has been linked to more than 60 disease conditions, birth defects and disabilities. Damage is a diverse continuum from mild intellectual and behavioural issues to profound disabilities or premature death. Prenatal alcohol damage varies due to volume ingested, timing during pregnancy, peak blood alcohol levels, genetics and environmental factors.

There are very few physicians who are trained, or inclined, to diagnose Fetal Alcohol Spectrum Disorders (FASD) and there is no national diagnostic data collection mechanism for FASD or mandatory reporting of FASD and its subset diagnoses. As such, the true incidence of FASD is not precisely known and appears to be grossly under-diagnosed. Therefore, it is necessary to approach the subject from other avenues.

Many prenatally alcohol exposed children are diagnosed with other conditions that do not carry the social baggage of an alcohol related condition. This can result in inappropriate treatment protocols, years of frustration for the child, the family, educators, and eventually the courts. Failure to confront the elephant in the livingroom results in multi-generational FASD and enormous social and financial costs. Massive denial is the hallmark of alcohol issues in our society.

The Method

To begin to estimate the incidence of FASD, first it is important to look at prenatal exposure rates to beverage alcohol. Next is an overview of various conditions known to be caused by prenatal exposure to alcohol. Finally, there is a look at incidence markers, such as students receiving special education services for conditions of types known to be the result of prenatal alcohol exposure.

1. The Statistics Canada, Canadian Community Health Survey 2000/2001 as well as population and birth data for the same period were compared and the birth rates for alcohol exposed children were determined.
2. Existing literature and new research reports were reviewed to identify effects, conditions and disabilities known to be caused by prenatal exposure to alcohol.
3. Studies of student populations were used as virtually all children are eligible and required to be enrolled in the education system, and there are longitudinal data identifying academic, behavioural, medical, social and environmental variables. Ontario now regulates school leaving to age 18. Typical of school boards in Canada, Ontario's Lambton Kent District School Board (urban / rural mix) with 28,000 Elementary and Secondary School students has 6,000 students (**21.4%**) receiving services from the Special Education Department. While not all the individuals with disabilities are identified as the disabilities having been caused by prenatal exposure to alcohol, the vast majority of the disabilities are of types known to be caused by prenatal alcohol exposure. Results of prenatal exposure to alcohol can include Neurological, Physical, Behavioural and Social issues. The Ontario Ministry of Education "Exceptionalities" are considered in relation to Section 2 "Results of Prenatal Alcohol Exposure".

Background

"FAS represents the largest environmental cause of behavioral teratogenesis yet discovered and, perhaps, the largest single environmental cause that will ever be discovered." (Riley, E. P., and Vorhees, C. V. (1986). Handbook of Behavioral Teratology. Plenum Press, New York, NY)

"Of all the substances of abuse, including heroin, cocaine, and marijuana, alcohol produces by far the most serious neurobehavioral effects in the fetus." (Institute of Medicine 1996 Report to Congress)

With any condition, doctors generally deal with the more extreme (obvious) cases and with FASD it is the extreme end of the physical appearance spectrum that is most likely to be diagnosed, if at all. Yet research has not found a safe level of alcohol exposure during pregnancy and we have seen that the damage is a diverse continuum, rather than a threshold condition. However, we also know, "Children with and without physical features of fetal alcohol syndrome display qualitatively similar deficits."¹⁸

Primary disabilities are those the child is born with and **secondary disabilities** are those that develop as a result of the failure to diagnose and treat the primary disabilities when the child is young. Failure to properly diagnose and treat FASD leads to development of secondary disabilities, such as mental health problems; disrupted school experience; trouble with the law; confinement in prison, drug or alcohol treatment center or mental institution; inappropriate sexual behaviour; alcohol and drug problems; inability to live independently; and employment problems.¹³ (Streissguth AP, 1997)

"The girls get pregnant and the boys get locked up." They are followers, easily misled, with little or no appreciation of consequences. Without intervention, many ride the justice system merry-go-round or become "homeless street people". They are required to compete in society but have been denied the tools to do so.

Many children with FASD are born to multi-generational drinkers. Children with FASD are having babies with FASD. Inability to predict consequences, impulsivity, high potential for alcohol addiction and a hormone driven twitch in the kilt are a dangerous combination. These individuals are less likely to get proper prenatal care, admit to alcohol consumption (let alone accurately admit the quantity and frequency), or maintain proper nutrition during pregnancy. Many of these babies with FASD will never be diagnosed but will continue the cycle.

While prenatal alcohol exposure is the leading cause of mental retardation, **many individuals with FASD have a normal to high IQ.**

Conclusions

37% of babies have been exposed to multiple episodes of binge drinking (5+ drinks per session) during pregnancy. An additional 42% have been multiply exposed to 1 to 4 drinks per session during pregnancy. Prenatal alcohol exposure has been linked to more than 60 disease conditions, birth defects and disabilities. Damage is a diverse continuum from mild intellectual and behavioural issues to profound disabilities or premature death. Prenatal alcohol damage varies due to volume ingested, timing during pregnancy, peak blood alcohol levels, genetics and environmental factors. Acute ethanol produces a global effect on the neuro-metabolome. Ethanol was found to interact with over 1000 genes and cell events, including cell signalling, transport and proliferation.

Approximately 20% of Canadian school age children are receiving special education services, most for conditions of the types known to be caused by prenatal alcohol exposure. As FASD is a diverse continuum, issues range from almost imperceptible to profound. It is somewhere in the middle that the issues attract the attention of parents, educators, medical and social work professionals, and the justice system. Most of the issues that attract sufficient attention are behavioural issues. "The most outstanding characteristics of FAS are bad judgment and the inability to make the connection between an act and its consequences."¹³

It is likely that between 10% and 15% of children are significantly enough affected by prenatal alcohol exposure to require special education. As they become adults, FASD does not disappear but the issues of youth translate into ongoing problems in family relationships, employment, mental health and justice conflicts. The cost to the individuals affected, their families and society are enormous and as a society, we cannot afford to ignore them. To ignore the facts does not change the facts.

Summary of Exposure Rates

In Canada, **79%** of babies are exposed prenatally to alcohol. More than **37%** of babies have been multiply exposed to binges of 5+ drinks per occasion in the first trimester, often before the girl knew she was pregnant. Another **42%** have been exposed to multiple sessions of 1 to 4 drinks per occasion. All will be affected to some degree. Meconium studies show 15% to 18% continue to drink throughout the pregnancy, 4% at elevated levels.

Binge drinking is defined as 5 or more standard drinks on one occasion. Legally intoxicated is defined as a Blood Alcohol Level of .08%. A 100 lb (45 kg) female consuming 5 standard drinks will normally reach a BAL of .25% - three times the legal limit. (Table 6) A baby in utero will reach the same level of blood alcohol as the mother but because it has an immature digestive system, it cannot process and eliminate alcohol at the same rate as the mother. Consequently it will be exposed for longer periods to higher levels of alcohol than the mother.

In the primary fertility years between ages 12 to 49, the female who binge drinks 1 to 11 times per year has a 50% higher probability of pregnancy than those who are non-drinkers. Females who binge drink 1 to 11 times per year represent 20.0% of the female population and 24.50% of the births. In that same age range, females who binge drink 12 or more times per year represent 11.0% of the female population and 12.7% of the births. In the same age range, females who do not drink alcohol represent 25% of the female population and 20.8% of the births. As about 50% of pregnancies are unplanned, it is likely that most unplanned pregnancies are among binge and high level drinkers.

“Alcohol’s **only** purpose is to make the brain take a hike.” (*Robin Williams*) It reduces inhibitions and severely impairs judgment. Those who drink at higher levels are more likely to engage in unprotected sex and less likely to consistently employ birth control. The result is a disproportionately higher percentage of babies who have been exposed to multiple sessions of binge drinking.

Table 1 Summary of Prenatal Exposure Rates - 2001

Total Canadian Births	333,744	Binge 1 to 11 times/yr <u>increased</u> probability of pregnancy	22.28%
Alcohol Exposed Babies	264,220	Binge 12+ times/ yr <u>increased</u> probability of pregnancy	15.59%
Total % of babies exposed to alcohol	79.17%	Drink 1 to 4 per sitting <u>decreased</u> probability of pregnancy	4.46%
Number of babies exposed to Binges	124,162	Non-drinker <u>decreased</u> probability of pregnancy	16.86%
% of babies exposed to Binges	37.20%	Increased probability of pregnancy of a 1 to 11 times/yr binge drinker versus a non-drinker	49.7%
# exposed to 1 to 4 drinks per session	140,058		
%exposed to 1 to 4 drinks per session	41.97%		

Exposure Rates

Calculations

Statistics Canada Tables were used to build a Microsoft Excel spreadsheet. For ease of printing, the spreadsheet has been broken into 3 tables, Tables 2, 3 and 4.

Table 2 Females Who Drink Beverage Alcohol And Those Who Do Not.

Table 3 Females Who Binge Drink 5 or More Drinks per Occasion

Table 4 Females Who Drink 1 To 4 Drinks per Occasion

The detailed Source Tables follow, Tables 5, 6 and 7.

Table 5 - Statistics Canada, Canadian Community Health Survey, 2000/01 - CANSIM table number 1050031 - Frequency of drinking 5 or more drinks on one occasion in the last 12 months, by age group and sex, household population aged 12 and over who are current drinkers, Canada, 2000/01 <http://www.statcan.ca/english/freepub/82-221-XIE/00502/tables/html/2155.htm> ²⁶

Table 6 - Statistics Canada - Live Births 2001 - Live births, by age of mother
ht://www.statcan.ca/english/freepub/82-224-XIE/2003000/t001_en.htm?#T001FN4 ²⁷

Table 7 - Statistics Canada - Annual Demographic Statistics 2001
Statistics Canada, Catalogue no. 91-213 pg 46 ²⁸

As the Statistics Canada, Canadian Community Health Survey, 2000/01 was conducted in 2000/01, the corresponding 2001 statistics for live births and population were used.

For those who binge drink 1 to 11 times per year, the median would be 6 times. It is assumed those events are spread throughout the year. For the group identified as binge drinking 12 or more times per year, it is a much broader range of binge events, from 12 to 365 times. Pregnancy is usually not detected until 2 or 3 months along. People tend to greatly underestimate both the frequency and quantity of their drinking.

When a pregnancy is confirmed, many women will stop drinking. However, meconium assays for Fatty Acid Ethyl Esters (FAEE) show 15% to 18% will continue to drink throughout the pregnancy, 4% at elevated levels.

While rates of binge drinking may vary between communities, cultures and sub-cultures, this study identifies the overall rates for Canada. Alcohol abuse is found across the full spectrum of Canadian society, rich or poor, of all cultures and ages. For many, binge drinking begins as an adolescent sport, propelled by peer pressure, discount "Happy Hour", games, and loud music. For others, it starts as an attempt to "kill the pain" of physical, mental or sexual abuse, grinding poverty, loneliness or depression. For some it ends in a coffin - by accident, suicide, violent event or alcohol induced disease.

There can be the perception that alcohol abuse is primarily among the poor. This perception may be because they are often under the microscope of social services and other agencies. However, those in the higher socio-economic groups are in a better position to hide substance abuse, particularly for economic reasons. The families and co-workers become complicit in the substance abuse by enabling the abuser to continue undetected. One does not kill the goose that lays the golden egg.

Table 2 Females Who Drink Beverage Alcohol And Those Who Do Not.

2001 Birth Stats	Canada Live Births	Total Female Population	# of females who drink	% of females who drink	% of babies exposed to alcohol	# Babies exposed to alcohol	# females who do not drink	% of females who do not drink	% of babies not exposed to alcohol	# of babies not exposed to alcohol
Year 2001	333,744									
Year 2004	337,072									
Age 12 to 49		8,668,743	6,497,270	75.0%			2,171,473			
Ages 12 to 14		607,434								
Under 15	116	607,434	121,262	20.0%	20.0%	23	486,172	80.0%	80.0%	93
15 to 19	16,456	1,013,994	715,062	70.5%	70.5%	11,605	298,932	29.5%	29.5%	4,851
20 to 24	58,186	1,033,611	881,973	85.3%	85.3%	49,650	151,638	14.7%	14.7%	8,536
25 to 29	102,453	1,047,458	811,164	77.4%	77.4%	79,341	236,294	22.6%	22.6%	23,112
30 to 34	101,460	1,126,228	872,164	77.4%	77.4%	78,572	254,064	22.6%	22.6%	22,888
35 to 39	46,704	1,315,449	1,076,320	81.8%	81.8%	38,214	239,129	18.2%	18.2%	8,490
40 to 44	7,995	1,329,446	1,087,772	81.8%	81.8%	6,541	241,674	18.2%	18.2%	1,453
45 to 49	352	1,195,123	931,553	77.9%	77.9%	274	263,570	22.1%	22.1%	78
49 to 54		1,060,244								
Not stated	22									
Age 12 to 49	333,744	8,668,743	6,497,270	75.0%	79.2%	264,220	2,171,473	25.0%	20.8%	69,502

Table 3 Females Who Binge Drink 5 Or More Drinks Per Occasion

2001 Birth Stats	Canada Live Births	Total Female Population	# of females who binge 1 to 11 times/yr	% of females who binge 1 to 11 times/yr	% of babies binge exposed 1 to 11/yr	# Babies binge exposed 1 to 11 times	# of females who binge 12+ times/yr	% of females who binge 12+ times/yr	% of babies binge exposed 12+	# Babies binge exposed 12+
Year 2001	333,744									
Year 2004	337,072									
Age 12 to 49		8,668,743								
Ages 12 to 14		607,434								
Under 15	116	607,434	16,747	2.8%	2.8%	3	8,197	1.3%	1.3%	2
15 to 19	16,456	1,013,994	215,186	21.2%	21.2%	3,492	157,678	15.6%	15.6%	2,559
20 to 24	58,186	1,033,611	303,187	29.3%	29.3%	17,068	229,616	22.2%	22.2%	12,926
25 to 29	102,453	1,047,458	259,624	24.8%	24.8%	25,394	110,684	10.6%	10.6%	10,826
30 to 34	101,460	1,126,228	279,148	24.8%	24.8%	25,148	119,007	10.6%	10.6%	10,721
35 to 39	46,704	1,315,449	254,942	19.4%	19.4%	9,052	128,846	9.8%	9.8%	4,575
40 to 44	7,995	1,329,446	257,655	19.4%	19.4%	1,549	130,217	9.8%	9.8%	783
45 to 49	352	1,195,123	149,976	12.5%	12.5%	44	68,818	5.8%	5.8%	20
49 to 54		1,060,244								
Not stated	22									
Age 12 to 49	333,744	8,668,743	1,736,465	20.0%	24.5%	81,750	953,063	11.0%	12.7%	42,412

Table 4 Females Who Drink 1 To 4 Drinks Per Occasion

2001 Birth Stats	Canada Live Births	Total Female Population	# females who drink 1 to 4 drinks per sitting	% of females who drink 1 to 4 drinks per sitting	% of babies exposed to 1 to 4 drinks per sitting	# of babies exposed to 1 to 4 drinks per sitting
Year 2001	333,744					
Year 2004	337,072					
Age 12 to 49		8,668,743				
Ages 12 to 14		607,434				
Under 15	116	607,434	96,318	15.9%	15.9%	18
15 to 19	16,456	1,013,994	342,198	33.7%	33.7%	5,553
20 to 24	58,186	1,033,611	349,170	33.8%	33.8%	19,656
25 to 29	102,453	1,047,458	440,856	42.1%	42.1%	43,121
30 to 34	101,460	1,126,228	474,009	42.1%	42.1%	42,703
35 to 39	46,704	1,315,449	692,532	52.6%	52.6%	24,588
40 to 44	7,995	1,329,446	699,900	52.6%	52.6%	4,209
45 to 49	352	1,195,123	712,759	59.6%	59.6%	210
49 to 54		1,060,244				
Not stated	22					
Age 12 to 49	333,744	8,668,743	3,807,742	43.9%	42.0%	140,058

Table 4 uses calculated results for “# females who drink 1 to 4 drinks per sitting”. It includes the categories “Never 5 or more drinks on one occasion” and “Drinking frequency, not stated” in the original Statistics Canada table *Population aged 12 and over who are current drinkers*. “Drinking frequency, not stated” is for those who confirm they do drink but who will not state the frequency.

About 50% of pregnancies are unplanned. Most girls are 2 to 3 months pregnant before they find out. In some cases, it is much longer. The baby may have been swimming in alcohol at many parties before the pregnancy was known. If she stops drinking then, she will often assume no damage has been done, or she may worry throughout the pregnancy about the damage she may have already done. Some will continue to drink throughout the pregnancy.

“In Ontario, 83% of Grade 12 students drink, and 45% have had at least one episode of binge drinking in the previous 4 weeks, according to the 2003 Ontario Student Drug Use Survey. While the percentage of students binge drinking increases with each grade, the biggest single increase – from 8 to 24 percent – occurs between Grades 8 and 9.” A significant number of kids are starting very young.

“A 2003 survey of British Columbia high-school students conducted by the McCreary Centre Society found that 46 percent of males and 43% of females in high school who admitted to drinking had engaged in binge drinking in the previous month.”

“The Canadian Campus Survey in 2000 found that 63% of students reported consuming 5 or more drinks in a single sitting in the previous year.”

These results compare to those included in the Centers for Disease Control CDC Behavioral Risk Factor Surveillance System and the SAMSHA National Household Survey on Drug Abuse (U.S.A. Substance Abuse and Mental Health Services Administration - <http://www.samhsa.gov>).

Meconium is the first bowel movement by a newborn infant. Available since at least 2001, the meconium based assay incorporates a panel of Fatty Acid Ethyl Esters as bio-markers of maternal alcohol use during the last 20 weeks of pregnancy. Studies with the MecStat-EtOH assay (Avitar Technologies Inc., United States Drug Testing Laboratories) found fetal exposure to alcohol in **15-18%** of newborns tested, approximately **4%** of the newborns had elevated results.

As the meconium test does not detect exposure in the first 4.5 months, it would not include those mothers who drank during the first trimester and quit when they discovered they were pregnant. Yet major damage could have already occurred to the baby.

In a confirming study of all newborns in Grey – Bruce Counties, Ontario, it was found the mothers either lied or substantially underestimated their alcohol use throughout the pregnancy. As confirmed prenatal exposure to alcohol is currently critical to a proper diagnosis and intervention, the meconium for all newborns should be routinely tested.

Both the Avitar/USDTL and Grey-Bruce studies showed very high levels of alcohol use in **4%** of newborns in the final 20 weeks of gestation. For some reason, the Grey-Bruce study did not report on lower levels of detection, possibly because the funding source is the beverage alcohol industry.

Table 5²⁶ Frequency of drinking 5 or more drinks on one occasion in the last 12 months, by age group and sex, household population aged 12 and over who are current drinkers, Canada, 2000/01

Frequency of heavy drinking	Total population reporting drinking	Never 5 or more drinks on one occasion		5 or more drinks on one occasion, less than twelve times a year		5 or more drinks on one occasion, twelve or more times a year		Drinking frequency, not stated	
	Number	Number	%	Number	%	Number	%	Number	%
2000/2001									
Total, 12 years and over	19,832,244	11,028,396	55.6	4,618,818	23.3	3,979,661	20.1	205,369	1
Males	10,254,854	4,624,858	45.1	2,606,918	25.4	2,902,319	28.3	120,759	1.2
Females	9,577,389	6,403,537	66.9	2,011,900	21	1,077,342	11.2	84,610	0.9
12-19 years									
	1,732,962	810,443	46.8	456,590	26.3	435,482	25.1	30,448	1.8
Males	896,639	385,784	43	224,658	25.1	269,607	30.1	16,590	1.9
Females	836,324	424,658	50.8	231,932	27.7	165,875	19.8	13,858	1.7
12-14 years									
	263,807	213,023	80.7	33,675	12.8	12,544	4.8	4,564E	1.7E
Males	142,545	118,252	83	16,929	11.9	4,347E	3.0E	F	F
Females	121,262	94,772	78.2	16,747	13.8	8,197	6.8E	F	F
15-19 years									
	1,469,155	597,419	40.7	422,915	28.8	422,937	28.8	25,884	1.8
Males	754,094	267,533	35.5	207,729	27.5	265,260	35.2	13,572	1.8
Females	715,062	329,886	46.1	215,186	30.1	157,678	22.1	12,312E	1.7E
20-34 years									
	5,419,565	2,041,432	37.7	1,717,520	31.7	1,587,004	29.3	73,609	1.4
Males	2,854,263	805,019	28.2	875,561	30.7	1,127,698	39.5	45,986	1.6
Females	2,565,302	1,236,413	48.2	841,959	32.8	459,307	17.9	27,623	1.1

20-24 years	1,854,368	561,994	30.3	569,025	30.7	687,829	37.1	35,519E	1.9E	
Males	972,394	223,558	23	265,838	27.3	458,213	47.1	24,785E	2.5E	
Females	881,973	338,436	38.4	303,187	34.4	229,616	26	10,734E	1.2E	
Frequency of heavy drinking	Total, population reporting drinking	Never 5 or more drinks on one occasion		5 or more drinks on one occasion, less than twelve times a year		5 or more drinks on one occasion, twelve or more times a year		Drinking frequency, not stated		
	Number	Number	%	Number	%	Number	%	Number	%	
25-34 years	3,565,197	1,479,437	41.5	1,148,495	32.2	899,175	25.2	38,090	1.1	
Males	1,881,869	581,461	30.9	609,723	32.4	669,484	35.6	21,201E	1.1E	
Females	1,683,328	897,976	53.3	538,772	32	229,691	13.6	16,889E	1.0E	
35-44 years	4,470,852	2,332,263	52.2	1,188,862	26.6	923,006	20.6	26,721	0.6	
Males	2,306,760	951,405	41.2	676,264	29.3	663,943	28.8	15,148	0.7	
Females	2,164,092	1,380,858	63.8	512,597	23.7	259,063	12	11,574	0.5	
45-64 years	5,824,995	3,786,967	65	1,078,972	18.5	908,842	15.6	50,214	0.9	
Males	3,025,253	1,564,736	51.7	698,182	23.1	732,817	24.2	29,517	1	
Females	2,799,743	2,222,230	79.4	380,790	13.6	176,026	6.3	20,697	0.7	
45-54 years	3,625,833	2,207,017	60.9	759,438	20.9	626,189	17.3	33,189	0.9	
Males	1,867,862	874,494	46.8	476,412	25.5	496,321	26.6	20,636	1.1	
Females	1,757,972	1,332,523	75.8	283,026	16.1	129,869	7.4	12,554E	0.7E	
55-64 years	2,199,162	1,579,950	71.8	319,534	14.5	282,653	12.9	17,025	0.8	
Males	1,157,391	690,243	59.6	221,770	19.2	236,496	20.4	8,882	0.8	
Females	1,041,771	889,707	85.4	97,764	9.4	46,157	4.4	8,143E	0.8E	
65 years and over	2,383,869	2,057,292	86.3	176,875	7.4	125,326	5.3	24,376	1	
Males	1,171,939	917,913	78.3	132,253	11.3	108,255	9.2	13,518E	1.2E	
Females	1,211,929	1,139,379	94	44,621	3.7	17,071	1.4	10,858	0.9	
65-74 years	1,518,045	1,257,976	82.9	139,351	9.2	105,799	7	14,920E	1.0E	
Males	768,909	564,317	73.4	103,020	13.4	91,837	11.9	9,735E	1.3E	
Females	749,137	693,659	92.6	36,331	4.8	13,962	1.9	5,185E	0.7E	
75 years and over	865,823	799,316	92.3	37,524	4.3	19,527	2.3	9,456	1.1	
Males	403,031	353,596	87.7	29,233	7.3	16,418	4.1	3,783E	0.9E	
Females	462,792	445,720	96.3	8,290E	1.8E	3,109E	0.7E	5,674E	1.2E	
1	<i>Data source: Statistics Canada, Canadian Community Health Survey, 2000/01</i>									
2	<i>Population aged 12 and over who are current drinkers and who reported drinking 5 or more drinks on at least one occasion in the past 12 months.</i>									
3	<i>Bootstrapping techniques were used to produce the coefficient of variation (CV) and 95% confidence intervals (CIs).</i>									
4	<i>Data with a coefficient of variation (CV) from 16.6% to 33.3% are identified by an (E) and should be interpreted with caution.</i>									
5	<i>Data with a coefficient of variation (CV) greater than 33.3% were suppressed (F) due to extreme sampling variability.</i>									
6	<i>Health regions are defined by provincial governments as the areas of responsibility for regional health boards (i.e., legislated) or as regions of interest to health care authorities.</i>									
7	<i>A "peer group" is a grouping of health regions that have similar social and economic characteristics.</i>									
8	<i>In Newfoundland and Labrador, health regions are generally referred to as Health and Community Services (HCS) regions.</i>									

9	<i>In Prince Edward Island, the two health regions divide the province into urban and rural components.</i>
10	<i>Prince Edward Island has defined these health regions for statistical purposes only; they bear no resemblance to the boundaries of the five actual administrative health regions.</i>
11	<i>In Nova Scotia, health regions are known as "health zones" and relate to the province's administrative health region boundaries.</i>
12	<i>In Ontario, Public Health Units (PHU) administer health promotion and disease prevention programs, and District Health Councils (DHC) are advisory, health planning organizations.</i>
13	<i>Because of the small population of Churchill, Manitoba (population: 1,110 in 1996), the Canadian Community Health Survey only collects data for the aggregation of Burntwood/Churchill (regions 4680, 4690).</i>
14	<i>In Saskatchewan, "service areas" (SA) have been created from groupings of the 33 health districts.</i>
15	<i>In Alberta, health regions are referred to as Health Authorities (HA) or Regional Health Authorities (RHA).</i>
16	<i>The following symbols are used in Statistics Canada publications: (..) for figures not available and (...) for figures not appropriate or not applicable.</i>
17	<i>CANSIM table number 1050031.</i>

Source: Statistics Canada's Internet Site

<http://www.statcan.ca/english/freepub/82-221-XIE/00502/tables/html/2155.htm>

Extracted May 28, 2002.

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Live births	Number of Events									
All ages	385,114	378,016	366,200	348,598	342,418	337,249	327,882	333,744	328,802	335,202
Under 20 years	23,980	23,657	21,824	19,920	19,913	18,982	17,503	16,572	15,533	14,945
Under 15 years	252	241	227	218	192	177	153	116	120	97
15 to 19 years	23,728	23,416	21,597	19,702	19,721	18,805	17,350	16,456	15,413	14,848
15 to 17 years	7,904	7,846	7,169	6,427	6,453	5,986	5,372	4,927	4,538	4,262
18 to 19 years	15,824	15,570	14,428	13,275	13,268	12,819	11,978	11,529	10,875	10,586
20 to 24 years	73,302	71,142	67,515	63,522	63,041	61,480	59,523	58,186	56,729	56,377
25 to 29 years	129,713	121,978	116,723	110,211	106,899	104,674	101,072	102,453	100,646	103,148
30 to 34 years	113,692	114,516	111,024	105,131	101,422	99,455	96,353	101,460	100,768	103,607
35 to 39 years	38,478	40,419	42,641	43,089	43,801	45,165	45,393	46,704	46,468	47,851
40 years and over	5,415	5,822	6,267	6,598	6,844	7,374	7,924	8,347	8,647	9,214
Unknown age group	534	482	206	127	498	119	114	22	11	60

Canada Live Births: http://www.statcan.ca/english/freepub/82-224-XIE/2003000/t001_en.htm?#T001FN4

Table 7²⁸ Annual Demographic Statistics 2001**Table 1.16 Population by Age Group and Sex, Canada July 1, 1998 to 2006**

Age Group and Sex	Estimations				Projections				
	1998	1999	2000	2001	2002	2003	2004	2005	2006
Females	b	15,397,282	15,535,348	15,693,393	15,817,994	15,934,493	16,043,085	16,143,516	16,236,008
0-4	914,242	892,106	870,470	847,207	833,314	820,374	807,587	793,898	781,628
5-9	1,006,588	1,005,380	996,640	990,613	969,911	949,898	929,832	908,793	883,740
10-14	982,396	986,490	998,436	1,012,390	1,025,794	1,035,401	1,035,675	1,027,090	1,018,698
15-19	996,446	1,003,992	1,008,975	1,013,994	1,016,573	1,016,977	1,022,064	1,034,023	1,045,524
20-24	996,975	1,008,863	1,020,104	1,033,611	1,040,840	1,050,112	1,057,066	1,060,820	1,062,869
25-29	1,052,783	1,046,337	1,044,630	1,047,458	1,053,047	1,059,747	1,069,922	1,077,846	1,086,234
30-34	1,199,077	1,158,945	1,132,037	1,126,228	1,121,136	1,116,403	1,110,639	1,107,634	1,104,360
35-39	1,336,690	1,342,385	1,337,061	1,315,449	1,282,443	1,240,575	1,202,592	1,175,277	1,164,628
40-44	1,259,987	1,283,153	1,304,893	1,329,446	1,342,220	1,355,986	1,363,188	1,357,397	1,332,484
45-49	1,098,511	1,128,013	1,161,959	1,195,123	1,230,505	1,260,972	1,284,248	1,305,004	1,326,562
50-54	939,104	982,372	1,025,179	1,060,244	1,069,585	1,088,180	1,116,887	1,149,852	1,180,633
55-59	725,812	755,651	785,857	821,342	880,031	927,651	970,333	1,011,994	1,045,128
60-64	618,570	629,994	642,547	660,424	683,392	712,798	742,166	771,356	805,100
65-69	594,804	593,096	590,722	589,461	588,826	592,846	603,994	615,726	632,144
70-74	543,950	543,554	544,966	546,984	549,192	549,438	547,245	544,699	543,085
75-79	445,826	462,753	471,479	476,492	476,470	477,945	477,061	477,962	479,533
80-84	295,956	300,177	311,449	327,641	345,457	361,539	375,239	381,951	385,750
85-89	171,704	180,226	189,269	194,742	198,811	200,547	203,357	211,483	222,652
90+	89,858	93,795	98,675	104,544	110,447	117,104	123,990	130,711	135,256
Statistics Canada, Catalogue no. 91-213 pg 46									

Table 8 Drink/Weight Index Chart									
		WEIGHT (pounds)							
		# OF DRINKS CONSUMED/SEX	100	120	140	160	180	200	220
1	Male	.04	.04	.03	.03	.02	.02	.02	.02
	Female	.05	.04	.04	.03	.03	.03	.02	.02
2	Male	.09	.07	.06	.05	.05	.04	.04	.04
	Female	.10	.08	.07	.06	.06	.05	.05	.04
3	Male	.13	.11	.09	.08	.07	.07	.06	.05
	Female	.15	.13	.11	.10	.08	.08	.07	.06
4	Male	.17	.15	.13	.11	.10	.09	.08	.07
	Female	.20	.17	.15	.13	.11	.10	.09	.09
5	Male	.22	.18	.16	.14	.12	.11	.10	.09
	Female	.25	.21	.18	.16	.14	.13	.12	.11
6	Male	.26	.22	.19	.16	.15	.13	.12	.11
	Female	.30	.26	.22	.19	.17	.15	.14	.13
7	Male	.30	.25	.22	.19	.17	.15	.14	.13
	Female	.36	.30	.26	.22	.20	.18	.16	.15
8	Male	.35	.29	.25	.22	.19	.17	.16	.15
	Female	.41	.33	.29	.26	.23	.20	.18	.16
9	Male	.39	.35	.28	.25	.22	.20	.18	.16
	Female	.46	.38	.33	.29	.26	.23	.21	.19
10	Male	.39	.35	.28	.25	.22	.20	.18	.16
	Female	.51	.42	.36	.32	.28	.25	.23	.21
11	Male	.48	.40	.34	.30	.26	.24	.22	.20
	Female	.56	.46	.40	.35	.31	.27	.25	.23
12	Male	.53	.43	.37	.32	.29	.26	.24	.21
	Female	.61	.50	.43	.37	.33	.30	.28	.25
13	Male	.57	.47	.40	.35	.31	.29	.26	.23
	Female	.66	.55	.47	.40	.36	.32	.30	.27
14	Male	.62	.50	.43	.37	.34	.31	.28	.25
	Female	.71	.59	.51	.43	.39	.35	.32	.29
15	Male	.66	.54	.47	.40	.36	.34	.30	.27
	Female	.76	.63	.55	.46	.42	.37	.35	.32

“This is only an estimation based on an average metabolic rate. Differences in metabolic rates, gender, types of drinks, food in the stomach etc. can contribute to substantial differences in your Blood Alcohol Levels. Also, there may be slight differences (.01 - .03) between the various BAL Charts that are available to you.

Other Factors Impacting BAL and Impairment: In addition to the amount of alcohol consumed, the speed at which it is consumed, and your tolerance, here are a number of other factors that will also affect how quickly and to what degree you will get impaired if you choose to drink:

- Food in the stomach will slow the absorption of alcohol into the bloodstream and delay impairment. The type of food ingested (carbohydrate, fat, protein) has not been shown to have a measurable influence on BAL. However, we do know that the larger the meal and the closer the time between eating and drinking, the lower the peak blood alcohol concentration. Studies have shown reductions in peak blood alcohol concentration (as opposed to those of a fasting individual under otherwise similar circumstances) of between 9 percent and 23 percent.

- Alcohol mixed with carbonated beverages such as Coca-Cola or Seven Up will be absorbed more quickly into the bloodstream. This is also true for champagne and wine coolers.

- Women who are pre-menstrual and sometimes those on birth control pills tend to get more impaired more quickly.

- Strong emotions—anger, fear, loneliness—tend to hasten impairment.

- If you are tired, sick or just getting over an illness, you tend to get more impaired more quickly.

- Mixing alcohol with other drugs often leads to increased impairment in a shorter period of time.”

(Jim Matthews, *Beer, Booze and Books*, <http://www.beerboozebooks.com/bal.htm>)²⁰

Results of Prenatal Alcohol Exposure

Results of prenatal exposure to alcohol can include Neurological, Physical, Behavioural and Social issues.

The World Health Organization's "WHO Global Status Report on Alcohol 2004 - Health effects and global burden of disease" states, "Alcohol use is related to a wide range of physical, mental and social harms. Most health professionals agree that alcohol affects practically every organ in the human body. Alcohol consumption was linked to more than 60 disease conditions. In the developed countries, 9.2% of all the disease burden is attributable to alcohol, only exceeded by the burden attributable to tobacco and blood pressure."

"Maternal alcohol consumption even at low levels was adversely related to child behavior; a dose-response relationship was also identified. The effect was observed at average levels of exposure of as low as 1 drink per week." (Pediatrics Vol. 108 No. 2 August 2001, p. e34).

"Even brief exposures to small amounts of alcohol may kill brain cells in a developing fetus. A study carried out by John Olney, M.D., at the Washington School of Medicine in St. Louis showed that just two drinks consumed during pregnancy may be enough to kill some developing brain cells, leading to permanent brain damage. Nerve cells will die if they fail to make synaptic connections in time. Drinking alcohol can interfere with the formation of these connections. Based on the animal studies carried out by Dr. Olney, it does not take much alcohol to have this effect. In unborn mice, the concentration of alcohol needed to kill developing brain cells was 0.07 percent. In most women, two cocktails are enough to elevate blood alcohol levels to this amount. Dr. Olney's advice is for pregnant women to completely avoid alcohol until further research can better explain the sensitivity of developing brain cells to alcohol." (Addiction Biology 2004 Jun;9(2):137-49)²⁴

"Studies done at the University of British Columbia may have uncovered the link between prenatal alcohol exposure and some of the long-term symptoms of FASD. Alcohol consumption affects both the maternal and fetal endocrine systems, altering the interaction between maternal-fetal hormones. Additionally, exposure to alcohol can cause reprogramming of the hypothalamic-pituitary-adrenal (HPA) axis in the fetus so that HPA tone is increased throughout life. Increasing HPA tone causes excess secretion of glucocorticoids. This in turn leads to altered behavioral and physiologic responses. Glucocorticoid secretion also causes suppression of the immune system which will increase the individual's vulnerability to disease later in life. The endocrine effects of alcohol exposure may explain the behavioral, cognitive, and immune deficits seen in patients with FASD." (Exp Biol Med (Maywood). 2005 Jun;230(6):376-88)²⁵

Table 9 outlines the Canadian diagnostic criteria.

<http://www.faslink.org/CanadianFASDdiagnosisGuidelines.pdf>

Fetal Alcohol Spectrum Disorders (FASD), Fetal Alcohol Syndrome (FAS), Fetal Alcohol Effects (FAE), Partial Fetal Alcohol Syndrome (pFAS), Alcohol Related Neurodevelopmental Disorders (ARND), Static Encephalopathy (alcohol exposed) (SE) and Alcohol Related Birth Defects (ARBD) are all names for a spectrum of disorders caused when a pregnant woman consumes alcohol.

Table 9 Institute of Medicine diagnostic criteria for fetal alcohol syndrome and alcohol-related effects

Fetal alcohol syndrome (FAS)

1. FAS with confirmed maternal alcohol exposure*

- A. Confirmed maternal alcohol exposure*
- B. Evidence of a characteristic pattern of facial anomalies that includes features such as short palpebral fissures and abnormalities in the premaxillary zone (e.g., flat upper lip, flattened philtrum and flat midface)
- C. Evidence of growth retardation, as in at least one of the following:
 - low birth weight for gestational age
 - decelerating weight over time not due to nutrition
 - disproportional low weight-to-height ratio
- D. Evidence of central nervous system neurodevelopmental abnormalities, as in at least one of the following:
 - decreased cranial size at birth
 - structural brain abnormalities (e.g., microcephaly, partial or complete agenesis of the corpus callosum, cerebellar hypoplasia)
 - neurologic hard or soft signs (as age appropriate), such as impaired fine motor skills, neurosensory hearing loss, poor tandem gait, poor eye-hand coordination

2. FAS without confirmed maternal alcohol exposure

B, C, and D as above

3. Partial FAS with confirmed maternal alcohol exposure

- A. Confirmed maternal alcohol exposure*
- B. Evidence of some components of the pattern of characteristic facial anomalies
Either C or D or E
- C. Evidence of growth retardation, as in at least one of the following:
 - low birth weight for gestational age
 - decelerating weight over time not due to nutrition
 - disproportionately low weight-to-height ratio
- D. Evidence of CNS neurodevelopmental abnormalities, e.g.,
 - decreased cranial size at birth
 - structural brain abnormalities (e.g., microcephaly, partial or complete agenesis of the corpus callosum, cerebellar hypoplasia)
 - neurologic hard or soft signs (as age appropriate) such as impaired fine motor skills, neurosensory hearing loss, poor tandem gait, poor eye-hand coordination
- E. Evidence of a complex pattern of behaviour or cognitive abnormalities that are inconsistent with developmental level and cannot be explained by familial background or environment alone: e.g., learning difficulties; deficits in school performance; poor impulse control; problems in social perception; deficits in higher level receptive and expressive language; poor capacity for abstraction or metacognition; specific deficits in mathematical skills; or problems in memory, attention or judgment.

Alcohol-related effects

Clinical conditions in which there is a history of maternal alcohol exposure, and where clinical or animal research has linked maternal alcohol ingestion to an observed outcome. There are 2 categories, which may co-occur. If both diagnoses are present, then both diagnoses should be rendered.

4. Alcohol-related birth defects (ARBD)

Congenital anomalies, including malformations and dysplasias

- Cardiac
- Atrial septal defects
- Ventricular septal defects
- Aberrant great vessels

Tetralogy of Fallot
 Skeletal
 Hypoplastic nails
 Shortened fifth digits
 Radioulnar synostosis
 Flexion contractures
 Camptodactyly
 Clinodactyly
 Pectus excavatum and carinatum
 Klippel-Feil syndrome
 Hemivertebrae
 Scoliosis
 Renal
 Aplastic, dysplastic, hypoplastic kidneys
 Horseshoe kidneys
 Ureteral duplications
 Hydronephrosis
 Ocular
 Strabismus
 Retinal vascular anomalies
 Refractive problems secondary to small globes
 Auditory
 Conductive hearing loss Neurosensory hearing loss
 Other
 Virtually every malformation has been described in some patient with FAS. The etiologic specificity of most of these anomalies to alcohol teratogenesis remains uncertain.

5. Alcohol-related neurodevelopmental disorder (ARND)

Presence of A or B or both.

A. Evidence of CNS neurodevelopmental abnormalities, as in any one of the following:

- decreased cranial size at birth
- structural brain abnormalities (e.g., microcephaly, partial or complete agenesis of the corpus callosum, cerebellar hypoplasia)
- neurologic hard or soft signs (as age appropriate), such as impaired fine motor skills, neurosensory hearing loss, poor tandem gait, poor eye-hand coordination

B. Evidence of a complex pattern of behaviour or cognitive abnormalities that are inconsistent with developmental level and cannot be explained by familial background or environment alone; e.g., learning difficulties; deficits in school performance; poor impulse control; problems in social perception; deficits in higher level receptive and expressive language; poor capacity for abstraction or metacognition; specific deficits in mathematical skills; or problems in memory, attention or judgment. *A pattern of excessive intake characterized by substantial, regular intake or heavy episodic drinking. Evidence of this pattern may include frequent episodes of intoxication, development of tolerance or withdrawal, social problems related to drinking, legal problems related to drinking, engaging in physically hazardous behaviour while drinking or alcohol-related medical problems such as hepatic disease.

†As further research is completed and as, or if, lower quantities or variable patterns of alcohol use are associated with ARBD or ARND, these patterns of alcohol use should be incorporated into the diagnostic criteria.

“Children with and without physical features of fetal alcohol syndrome display qualitatively similar deficits.”¹⁸

Table 10 Comparison of the effects of drugs on prenatal development

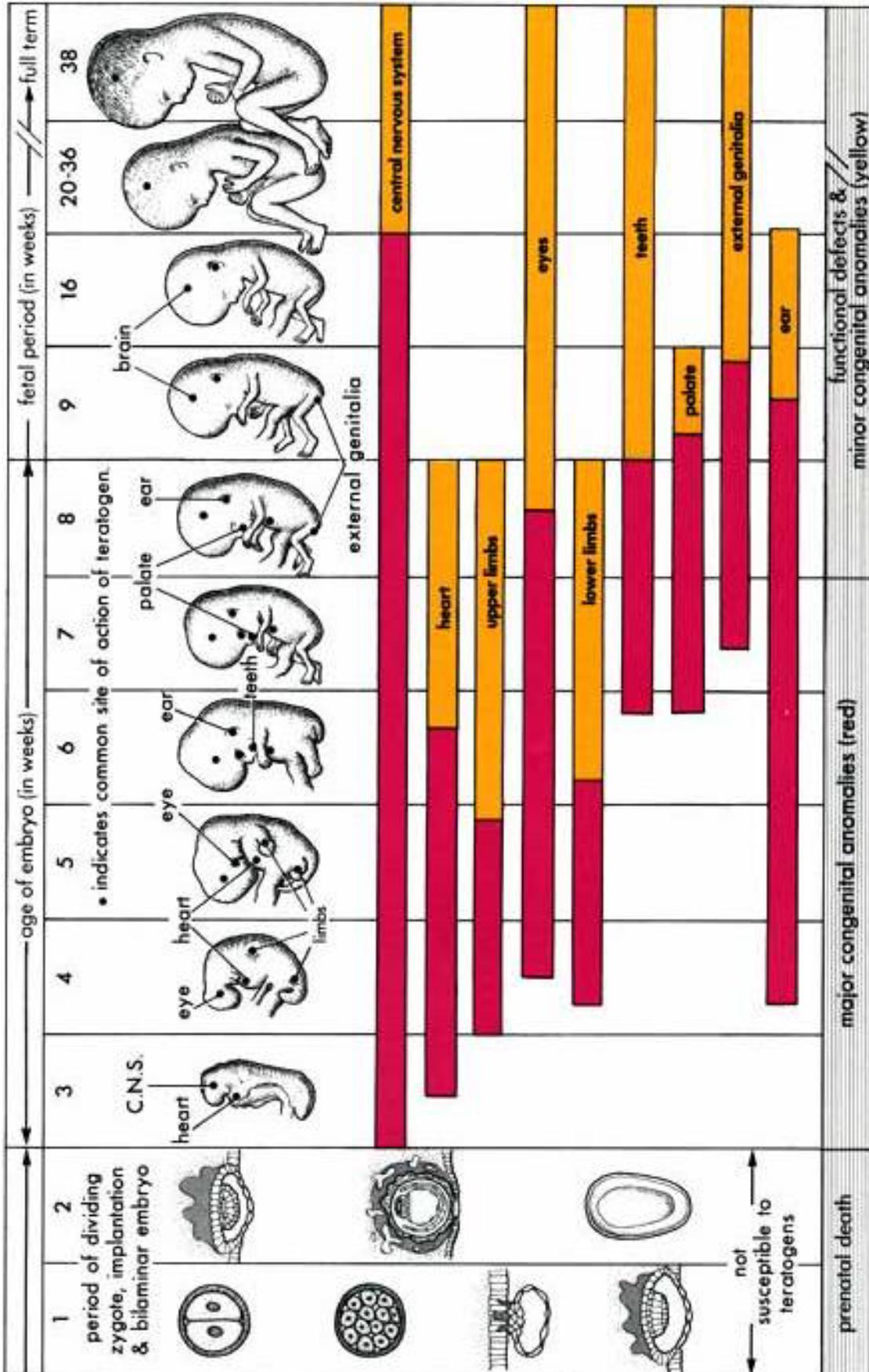
Prenatal alcohol exposure seems to have a more devastating long-lasting effect on the child than other street drugs (that have been studied-ed.). It is often difficult to identify the harm caused by illicit drugs because they are frequently taken in combination with alcohol. (Alcohol the drug is often seen as benign, not as "bad as" other drugs since it is legal. This chart provides a dear visual that this is not true.-ed.)

EFFECT	ALCOHOL	MARIJUANA	COCAINE	HEROIN	TOBACCO
Low Birth Weight	●		●	●	●
Impaired Growth	●				
Facial Malformation	●				
Small Head Size	●				
Intellectual & Developmental Delays	●	●			
Hyperactivity, Inattention	●	●		●	●
Sleeping Problems	●	●	●	●	●
Poor Feeding	●		●		
Excessive Crying	●	●	●	●	
Higher Risk for Sudden Infant Death Syndrome	●			●	●
Organ Damage, Birth Defects	●				
Respiratory-Problems	●			●	●

Alcohol destroys cells in the fetus, causing malformations. (These physical changes contribute to learning and behavioral differences that continue into adolescence and adulthood - ed.) Some effects of cocaine tend to diminish over time, and long-term damage may not be as severe as was originally predicted. Test Scores of children exposed to heroin show their physical and psychological development are usually within normal range.

Sources: US Department of Health and Human Services, 1994: Day et al., 1994

Table 11 Vulnerabilities Time Chart



While some of the conditions listed here are not exclusively caused by prenatal exposure to alcohol, the most common source of toxins that can cause that condition is prenatal exposure to beverage alcohol. With some conditions the high incidence of co-morbidity with Fetal Alcohol Spectrum Disorders indicates a common cause being either a direct or a secondary or tertiary cascade result of prenatal alcohol exposure.

Prenatal alcohol damage varies due to volume ingested, timing during pregnancy, peak blood alcohol levels, genetics and environmental factors.

It should be noted that beverage alcohol contains both ethanol and methanol. “Toxicity resulting from methanol is very well documented in both humans and animals and is attributed to its toxic metabolite formic acid. To understand ethanol toxicity and Fetal Alcohol Spectrum Disorders, it is important to consider methanol and its metabolite, formic acid, as potential contributors to the toxic effects of alcohol.”⁸

For more detail on medical conditions, Medline's A.D.A.M. Medical Encyclopedia includes over 4,000 articles about diseases, tests, symptoms, injuries, and surgeries. It also contains an extensive library of medical photographs and illustrations. <http://www.nlm.nih.gov/medlineplus/encyclopedia.html>

Because of cascade effects, it can be difficult to separate the effects of physical and neurological damage caused by prenatal exposure to alcohol, similar to the question, “which comes first, the chicken or the egg?” For example, serotonin suppression causes loss of neurons and glia, inducing excessive cell death during normal programmed death (apoptosis) or triggering apoptosis at inappropriate times⁵ leading to smaller or abnormal brain structures with fewer connections between brain cells, leading to fewer cells for dopamine production, leading to problems with addiction, memory, attention and problem solving, and more pronounced conditions such as schizophrenia.⁴ Microcephaly (head size much smaller than normal) is a frequent result of prenatal alcohol exposure. Many neurological issues manifest as learning, behavioural, mental health and social issues. The learning, behavioural, mental health and socials issues can in turn further stress the individual exacerbating neurological or immune system issues. The human systems affected must be seen as a 3 Dimensional web with damage in one area affecting multiple other systems.

Primary disabilities are those with which the child is born and **secondary disabilities** are those that develop as a result of the failure to diagnose and treat the primary disabilities when the child is young.

Secondary Disabilities¹³

Of FAE (Fetal Alcohol Effect) individuals between the ages of 12 and 51:

- 95% will have mental health problems;
- 60% will have “disrupted school experience”;
- 60% will experience trouble with the law;
- 55% will be confined in prison, drug or alcohol treatment centre or mental institution;
- 52% will exhibit inappropriate sexual behaviour.

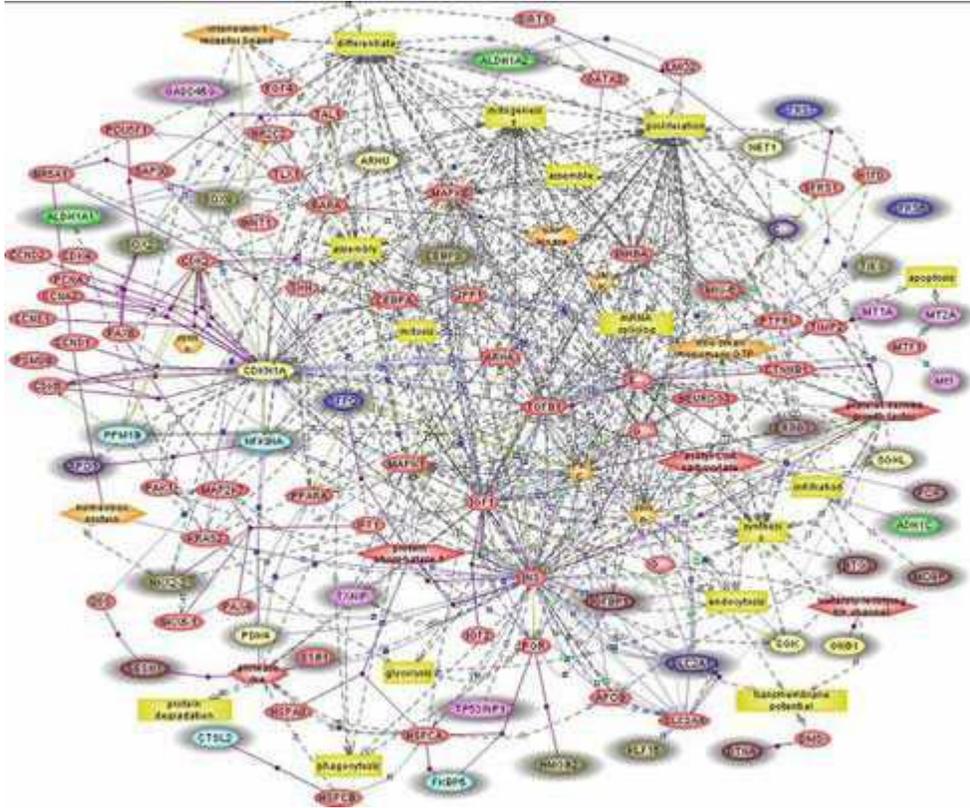
Of FAE individuals between 21 and 51:

- more than 50% of males and 70% of females will have alcohol and drug problems;
- 82% will not be able to live independently;
- 70% will have problems with employment

“Children with and without physical features of fetal alcohol syndrome display qualitatively similar deficits.”¹⁸

Genetics

The search for genetic causes involved in alcohol dependence/response has been challenging. Understanding the mechanisms of action and interaction of the genes implicated in alcohol response is a key towards understanding the problem. Sixty-nine ethanol responsive genes were used in a detailed genome-wide examination to study their neuro-metabolomics. These genes displayed very close interactions among themselves with over 400 regulation events and 100 expression events contributing to 15 different cell processes including cell signalling, transport and proliferation. Acute ethanol produces a global effect on the neuro-metabolome. **Ethanol alone was found to interact with over 1000 genes and cell events.** The study revealed that the ethanol responsive genes directly regulate and are themselves regulated by the activity of other proteins and cell processes. ²¹



Genetic mutation – sperm, ovum, cancer, etc.

Premature Death - medical, accidental, suicide, violence

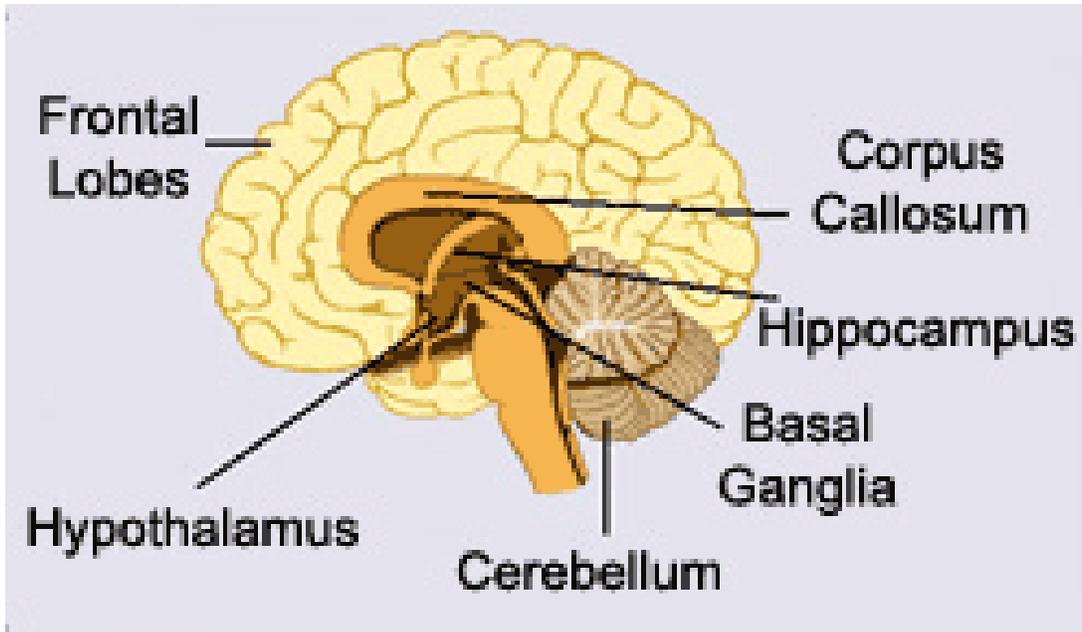
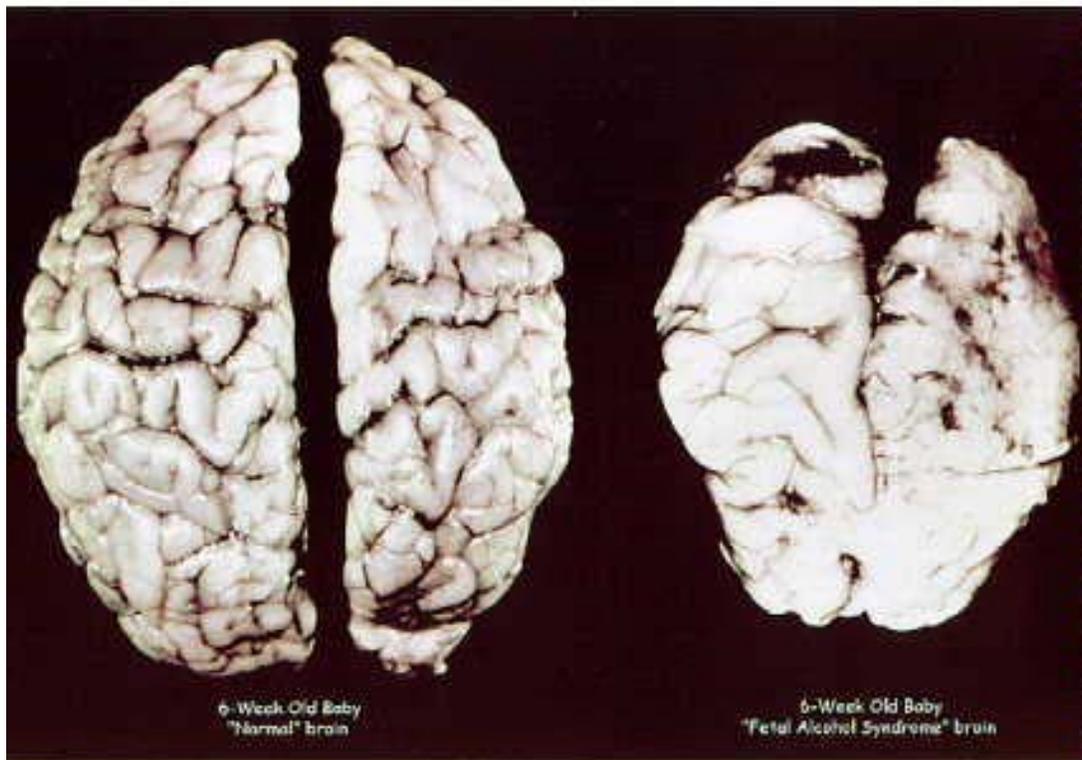
“Where services are lacking, omitted or not available, our children, whatever their ages, die - frozen in the snow bank, through suicide, through drug overdosing and complications, by being on the street, falling prey to predators, falling prey to abusers, making high risk decisions, falling into high risk behaviours, unable to keep jobs, lack of shelter and nutrition, and on and on and on.”¹² (Thelma Vincent letter to FASlink)

Serotonin suppression causes loss of neurons and glia. ⁵

Smaller or abnormal brain structures with fewer connections between brain cells ⁵
Fewer cells for dopamine production

Dopamine suppression. Can contribute to problems with addiction, memory, attention and problem solving, and more pronounced conditions such as schizophrenia. Dopamine is a key chemical messenger in the brain. ⁴

Brain malformation ¹¹



Frontal Lobes control judgment, inhibition, concentration, self-control, conscience, personality and emotional traits as well as cognition and memory, motor speech and movement skills. The Left Hemisphere deals with language based memory - logical interpretation of language, mathematics, abstraction and reasoning, facts and rules (such as safety and social). The Right Hemisphere deals with holistic functioning - processing of images, sound, touch, for a "holistic" picture. Memory here is visual, auditory and spatial. So, the Left side is logic, facts, rules. The

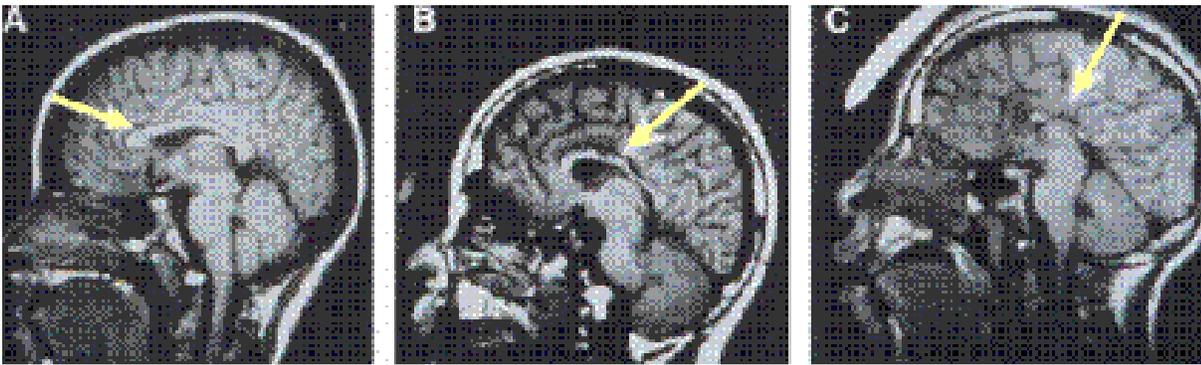
Right side is sensory input and reactive. The most noteworthy damage to the brain occurs in the prefrontal cortex which controls the Executive Functions.

Table 12 Executive Functions

Executive functions of the prefrontal cortex: ¹¹	Effects of alcohol exposure on behaviors related to executive functions:
Inhibition	Socially inappropriate behavior, as if inebriated
Problem solving	Inability to figure out solutions spontaneously
Sexual urges	Inability to control sexual impulses, esp. in social situations
Planning	Inability to apply consequences from past actions
Time perception	Difficulty with abstract concepts or time and money
Internal ordering	Like files out of order, difficulty processing information
Working memory	Storing and/or retrieving information
Self-monitoring	Needs frequent cues, requires policing by others
Verbal self-regulation	Needs to talk to self out loud, needs feedback
Motor control	Fine motor skills more affected than gross motor
Regulation of emotion	Moody roller-coaster emotions, exaggerated
Motivation	Apparent lack of remorse, need external motivators
Judgment	Inability to weigh pros and cons when making decisions

Corpus Callosum connects right and left sides of brain to allow communication between the hemispheres. In many individuals with FASD, the Corpus Callosum is damaged, smaller than normal or missing. One resulting problem can be failure to follow instructions. The individual may be able to physically hear instructions (right hemisphere) but be unable to process the meaning of the request and develop a prompt and appropriate response. The individual may then be seen as being oppositional and treated accordingly.

Dyslexia - Developmental reading disorder (inability to process graphic symbols) and Central Auditory Processing Disorder (CAPD - inability to process verbal instructions) may be similar information processing issues involving the right and left hemispheres and the corpus callosum.



Corpus Callosum

Hippocampus - plays a fundamental role in memory, learning, and emotion.

Neurobehavioral studies show that animals exposed prenatally to alcohol are impaired in many of the same spatial learning and memory tasks sensitive to hippocampal damage.¹⁶

Hypothalamus - controls appetite, emotions, temperature, and pain sensation. Controls and influences many automatic functions of the brain through actions on the medulla, and coordinates many chemical or endocrine functions (secretions of sex, thyroid and growth hormones) through chemical and nerve impulse actions on the pituitary gland. Alcohol depresses the nerve centres in the hypothalamus and inhibits the pituitary secretion of anti-diuretic hormone (ADH), which acts on the kidney to reabsorb water.

“Prenatal alcohol exposure alters sexual differentiation in males, perhaps by altering some aspect of the prenatal androgen environment.”¹⁴

"Our study demonstrated that exposure to alcohol during the third trimester, when components of the circadian system in the brain are developing, can lead to long-lasting alterations in the ability to entrain the cycles to environmental cues, like light/dark cycle. These data suggest that dysfunction of circadian systems may contribute to some of the behavioural problems observed in children with FASD."¹⁵

In mammals, the hypothalamus is a region of the brain located below the thalamus, forming the major portion of the ventral region of the diencephalon and functioning to regulate certain metabolic processes and other autonomic activities. The hypothalamus links the nervous system to the endocrine system by synthesizing and secreting neurohormones, often called releasing hormones, as needed that control the secretion of hormones from the anterior pituitary gland - among them, gonadotropin-releasing hormone (GnRH). The neurons that secrete GnRH are linked to the limbic system, which is very involved in the control of emotions and sexual activity. The hypothalamus also controls body temperature, hunger and thirst, and circadian cycles.
(*Wikipedia, the free encyclopedia*)

Cerebellum - controls coordination and movement, behavior and memory. The cerebellum is one area that is particularly vulnerable to prenatal alcohol. Heavy prenatal alcohol exposure causes microcephaly and disproportionate reductions in the corpus callosum, basal ganglia, and cerebellum.¹⁸

“Alcohol inhibits insulin-stimulated survival signals causing cerebellar hypoplasia in the developing brain. Using a rat model of FAS, this study found a decreased expression of the insulin gene in the cerebella of exposed rats. Alcohol exposure also caused a decrease in the amount of insulin, insulin-like growth factor receptor tyrosine kinase, glucose transport molecules, and steady-state

levels of ATP in the cells of the cerebellum. These results suggest cerebellar hypoplasia resulting from prenatal alcohol exposure is caused by a deficient energy supply.¹⁷

Basal Ganglia - affects spatial memory and behaviors like perseveration and the inability to switch modes, work toward goals, and predict behavioral outcomes, and the perception of time.¹⁸

Cognitive perseveration (over-focusing)

Behavioural rigidity - difficulty with activity transitions

Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD)

Inability to filter out distractions

Little or no retained memory – often cannot focus long enough to retain information

Learning disabilities

Mental health issues

Cancer, including: Childhood acute lymphoid leukemia (ALL)¹ and Childhood acute non-lymphoid leukemia (ANLL)¹

Heart -Cardiovascular and metabolic medical disorders, including ischemic heart disease, enlarged heart (cardiac hypertrophy), hypertension (high blood pressure), Interventricular septal defect, Atrial septal defect, insulin resistance, and non-insulin-dependent diabetes.⁷

Diabetes insipidus⁶

Schizophrenia

“The odds of the appearance of six psychiatric disorders and traits were more than double in adults exposed to one or more binge alcohol episodes in utero. Three of these six odds ratios were uniformly stable against confounding axis I substance dependence or abuse disorders and axis II passive-aggressive and antisocial personality disorders or traits.”¹⁰

Prenatal alcohol exposure can lead to early alcohol use and abuse in youth, leading to prenatal alcohol exposure in their offspring – a vicious circle creating a new generation with FASD.

Immune system suppression / malfunctioning

Brain Aneurysm

Agitation - extreme arousal, increased tension, and irritability.

Extreme agitation can lead to confusion, hyperactivity, and outright hostility.

Central auditory processing disorder (CAPD)

Oppositional Defiant Disorder – ODD

May actually stem from CAPD difficulties in processing verbal instructions and responding appropriately and promptly enough for the instructor. This may be seen as oppositional and lead to punishment which leads to frustration and fight/rages or flight/shut-down. Can unnecessarily escalate into violence in contact with law officers.

Reactive outbursts

Rages

Shut-down

Cognitive perseveration (over-focusing)

Autism

Autism and Asperger syndrome diagnoses may often actually be FASD

Autism is a physical condition linked to abnormal biology and chemistry in the brain. Autism is a complex developmental disorder that appears in the first 3 years of life, although it is sometimes diagnosed much later. It affects the brain's normal development of social and communication skills.

Autism is a spectrum that encompasses a wide range of behavior. The common features include impaired social interactions, impaired verbal and nonverbal communication, and restricted and repetitive patterns of behavior.

The symptoms may vary from moderate to severe. Two related, milder conditions are [Asperger syndrome](#) and "pervasive development disorder not otherwise specified" (PDD-NOS).

Most parents of autistic children suspect that something is wrong by the time the child is 18 months old and seek help by the time the child is 2. Children with autism typically have difficulties in verbal and nonverbal communication, social interactions, and pretend play. In some, aggression -- toward others or self -- may be present.

Some children with autism appear normal before age 1 or 2 and then suddenly "regress" and lose language or social skills they had previously gained. This is called the regressive type of autism.

People with autism may perform repeated body movements, show unusual attachments to objects or have unusual distress when routines are changed. Individuals may also experience sensitivities in the senses of sight, hearing, touch, smell, or taste. Such children, for example, will refuse to wear "itchy" clothes and become unduly distressed if forced because of the sensitivity of their skin. Some combination of the following areas may be affected in varying degrees.

Communication:

- Is unable to start or sustain a social conversation
- Develops language slowly or not at all
- Repeats words or memorized passages, like commercials
- Doesn't refer to self correctly (for example, says "you want water" when the child means "I want water")
- Uses nonsense rhyming
- Communicates with gestures instead of words

Social interaction:

- Shows a lack of empathy
- Does not make friends
- Is withdrawn
- Prefers to spend time alone, rather than with others
- May not respond to eye contact or smiles
- May actually avoid eye contact
- May treat others as if they are objects
- Does not play interactive games

Response to sensory information:

- Has heightened or low senses of sight, hearing, touch, smell, or taste
- Seems to have a heightened or low response to pain
- May withdraw from physical contact because it is overstimulating or overwhelming
- Does not startle at loud noises
- May find normal noises painful and hold hands over ears
- Rubs surfaces, mouths or licks objects

Play:

- Shows little pretend or imaginative play
- Doesn't imitate the actions of others
- Prefers solitary or ritualistic play

Behaviors:

- Has a short attention span
- Uses repetitive body movements
- Shows a strong need for sameness
- "Acts up" with intense tantrums
- Has very narrow interests
- Demonstrates perseveration (gets stuck on a single topic or task)
- Shows aggression to others or self
- Is overactive or very passive

Asperger syndrome

Asperger syndrome is a condition marked by impaired social interactions and limited repetitive patterns of behavior. Motor milestones may be delayed and clumsiness is often observed. Asperger syndrome is very similar to or may be the same as high functioning autism (HFA). Some researchers believe that Asperger syndrome is simply a mild form of autism.

- Abnormal nonverbal communication, such as problems with eye contact, facial expressions, body postures, or gestures
- Failure to develop peer relationships
- Being singled out by other children as "weird" or "strange"
- Lack of spontaneous seeking to share enjoyment, interests or achievements with others (a lack of showing, bringing, or pointing out objects of interest to other people)
- Markedly impaired expression of pleasure in other people's happiness
- Inability to return social or emotional feelings
- Inflexibility about specific routines or rituals
- Repetitive finger flapping, twisting, or whole body movements
- Unusually intense preoccupation with narrow areas of interest, such as obsession with train schedules, phone books, or collections of objects
- Preoccupation with parts of whole objects
- Repetitive behaviors, including repetitive self-injurious behavior

Developmental delay / PDD (pervasive development disorder)

Developmental speech and language disorder

Depression

Situational – punished constantly for “normal” behaviours; poor self-esteem

Social withdrawal

Suicide

Clinical – chemical

Bi-polar disorder

Social withdrawal

Suicide

Cerebral palsy - caused by injury to the cerebrum during fetal development

Complex seizure disorder

- Epilepsy
- Tremors
- Sleep disorders / Night terrors

Tourette Syndrome - multiple motor and vocal tics

One of the most disabling aspects of Tourette syndrome is the high rate of associated co-morbidities such as obsessive-compulsive disorder, attention deficit-hyperactivity disorder (ADHD), anger control problems, and poor social skills.

Developmental coordination disorder – Fine and gross motor skills problems**Dyslexia** - Developmental reading disorder - inability to process graphic symbols.

May be similar to the right and left hemisphere / corpus callosum processing issues of CAPD

Echolalia - repetition or echoing of verbal utterances**Extreme impulsiveness**

Tendency to compulsive reaction

Sensory integration problems

- Higher than normal to dangerously high pain tolerance for major insults
- Extreme sensitivity to touch, food and clothing texture, smell, and to minor injuries
- Insensitivity to cold and heat (dangerous)
- Bowel insensitivity
 - Limited intestinal peristalsis
 - Constipation, huge stools, rectal tearing

Little or no retained memory

Attachment Disorder – Can't remember people; therefore, can't attach.

Loss of intellectual functioning (IQ)

- Severely compromised life skills development
 - May have convergent IQ in normal to high normal range but very low divergent adaptive capacity (AQ)
 - Poor adaptive skills transferring learning to new situations (AQ)
 - Inability to predict consequences of actions
 - Difficulty predicting dangerous situations
 - Poor judgment
- Severe loss of intellectual potential
 - Mental Retardation

Emotional maturity far below chronological age

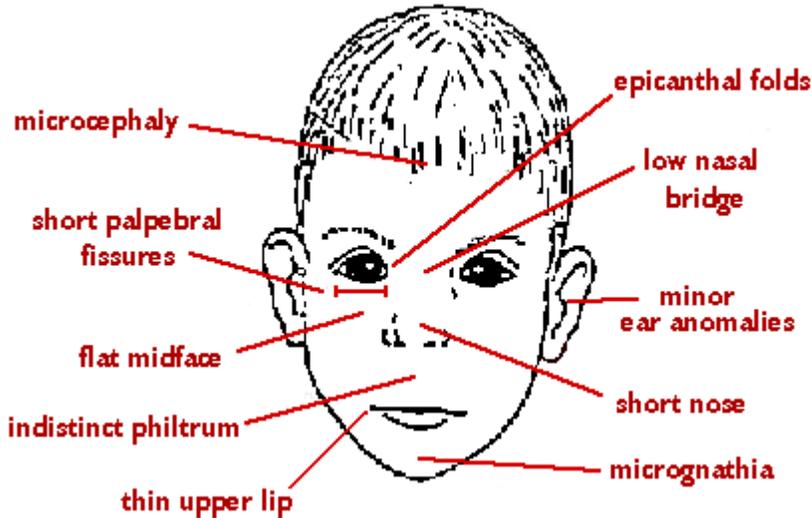
- Inability to build or to maintain interpersonal relationships
- Excessive fears or anxieties

Under normal height and weight**Failure to thrive syndrome** (Poor growth rate)

Swallowing/Feeding problems ⁹

Microcephaly

Facial anomalies (Caution must be exercised here as some facial features are formed in a very short time span. If the mother was not drinking at that specific time, the facial features may be normal but the neurological systems can be as severely compromised in FAS and FAE/pFAS/ARND.)



Smooth or flattened philtrum (indistinct notch under the nose)

Short palpebral fissures (Small eye openings)

Epicanthal folds

Abnormal position or formation of the ears (Rotated ear lobes)

Thin vermilion border of the upper lip (Thin upper lip)

Midface hypoplasia (Flat mid-face)

Micrognathia - small lower jaw

High arched palate

Hypertelorism (Eyes widely set)

Flat mid-face

Short, up-turned nose

Serious maxilo-facial deformities

Dental abnormalities

Cleft palate

Small teeth ⁹

Vision problems, including Esotropia, astigmatism, blindness

Speech impediments ⁹

Deafness / Hearing problems

Ear infections

Slack muscles ⁹

Limb and palmar (simian) crease abnormalities

- Hip deformities⁹
- Underdeveloped fingers⁹
- Shortened and bent little finger⁹
- Bent crooked little finger⁹

Spinal dimple⁹

Spina Bifida

Hair growth on back of neck⁹

Pigeon Chest⁹

Concave chest⁹

Genital deformities⁹

Undescended testicle(s)

Hernia⁹

Kidney and liver defects

- Kidney failure

Highly Concrete thinking

- Learn by see, touch, do – hands-on
- Takes language literally – does not understand idioms
 - Can attract jeering by peers
 - poor self-image
 - Inability to build or to maintain interpersonal relationships
 - Often relates far better to much younger individuals

Abstract concept difficulties

- Time
 - Consistently late
 - Punishment
- Value
 - Monetary value is abstract (item is concrete)
 - Easily defrauded
- Ownership
 - Misappropriation / stealing
 - Social sanctions
 - Imprisonment
- Mathematics – advanced
 - Learns by rote - unable to apply to varied situations

High level of verbal skills may mask low level of understanding

Little or no capacity for interpersonal empathy

- Difficulty reading social cues
- Inability to build or to maintain interpersonal relationships
- Isolation
 - Parallel play
 - Social disconnection
 - Depression
 - Disrupted school experience
 - Suicide

Little or no capacity for moral judgment

- Confabulation / Lying
 - May be filling in the gaps and actually believe the stories
 - May be trying to avoid punishment as a result of impulsive behaviour
- Misappropriation / stealing
 - Looks good - take it; feels good - do it
 - An object is concrete but ownership is an abstract concept.
 - May not understand "stealing". Can repeat the rules but does not internalize them, much like a tape recorder.
 - Social sanctions
 - Imprisonment
- Cruelty to animals
- Arson
- Sociopathic behaviour
 - Senior management
 - Confinement to mental institution or prison

Early drinking

- Alcohol and drug problems
- Offspring may be exposed, affected and carry on the cycle of FASD
- Confinement to alcohol or drug treatment center
- Death

Addiction

Drug dependence (addiction) is compulsive use of a substance despite negative consequences which can be severe. Physical dependence on a substance (needing a drug to function) is not necessary or sufficient to define addiction. "Alcoholism should not be judged as a problem of will power, misconduct, or any other unscientific diagnosis. The problem must be accepted for what it is - a biopsychosocial disease with a strong genetic influence, obvious signs and symptoms, a natural progression and a fatal outcome if not treated". (Thomas R. Hobbs PhD MD - Physician's News Digest of Feb. 1998)

Fight or Flight

- Bullying victim
 - Social disconnection
 - Depression
 - Suicide
 - Murder/Suicide
- Bullying behaviour

Sexuality

- Precocious (early onset) puberty
- Sexual assault victim
- Inappropriate sexual behaviour
 - High risk for STD's
 - Early pregnancy
 - Trouble with the law
 - Prostitution

High risk behaviour

- Failure to predict consequences of actions
- Adrenaline rush
 - Accidental death or injury
 - Violence

Employment problems

Inability to live independently

- Inability to earn or manage money
 - Poverty
 - Homelessness

Over-trusting, Easily misled

- Easily defrauded
- Easily misled to commit illegal acts and be blamed if caught
- Easily misled to confess to crimes not committed

Behavioural Problems

The following are behavioural problems from "A Fetal Alcohol Behavior Scale" published in the *Alcoholism: Clinical and Experimental Research* journal by Dr. Ann Streissguth
<http://depts.washington.edu/fadu> ²²

Behaviors in the Scale can include the following and are presented in order of frequency:

- unaware of consequences of an action
- poor attention (may not be true attention deficit disorder)
- can't take hints
- overreacts
- mood swings
- interrupts
- poor judgment
- likes to be the center of attention
- loses things
- overstimulated
- fidgety
- likes to talk
- demands attention
- often described as "...tries hard but..."
- out of context

overly friendly
 sleep problems
 superficial friendships
 hygiene problems
 messy
 touches people frequently
 chats but no content
 klutzy
 poor manners
 talks fast
 physically loving
 can't play team sports
 difficulty performing even though can repeat instructions
 unusual topics of conversation
 inappropriate behavior at home
 inappropriate behavior outside the home
 repeats often
 sensitive to noises
 loud, unusual voice
 problems with sexual function

Other Central Nervous System symptoms that have been reported by other researchers may include:

mental retardation (IQs of these children can range from 40 to 130)
 Cerebral Palsy symptoms
 epilepsy symptoms
 short term memory loss
 intermittent long term memory problems
 perseveration (does things over and over)
 attachment disorder
 speech and language problems
 receptive language disorder
 sensory integration dysfunction
 disorderly conduct
 has trouble learning new motor skills
 fine motor skills are problematic
 sensitive or insensitive to bright lights
 has dry, flaky skin
 distinct odor to self or room or clothes
 stomach and/or bowel problems
 unusual eye and hearing problems
 problems with menstrual periods
 may often be diagnosed as: ADHD, Asperger's, Autistic, Pervasive Developmental Delay, Antisocial Personality, Hyperactivity, Borderline Personality Disorder.

Behavioral problems might be apparent at birth, start with schooling or may not appear until the child begins puberty. The description of the parents often includes the phrase, "There is something wrong but I just can't put my finger on it." Children with full FAS are more easily recognized as having problems. Children with Fetal Alcohol Effects (FAE)/Alcohol Related Neurodevelopmental Disorders (ARND)/partial FAS do not have all of the physical signs of FAS but have most of the behavioral

problems. The majority of behavioral problems are not clearly evident until the child enters school.

From The August 1996 Final Report: Understanding the Occurrence of Secondary Disabilities in Clients with Fetal Alcohol Syndrome (FAS) and Fetal Alcohol Effects (FAE). This report may be ordered through the Fetal Alcohol and Drug Unit, University of Washington, 180 Nickerson, Suite 309, Seattle, Washington 98109-9112. Tel: 206-543-7155. Website: <http://depts.washington.edu/fadu>

"The most outstanding characteristics of FAS are bad judgment and the inability to make the connection between an act and its consequences." (Dr. Ann Streissguth, University of Washington)

Secondary disabilities are defined as those disabilities that a person is not born with and those disabilities that could be prevented or made less severe through better understanding and practical intervention. In a study conducted by the University of Washington on 473 clients, the following results were noted:

- 178 clients (almost 38%) were diagnosed with full FAS and had an average IQ of 79. (In all evaluations, a score of 100 is considered to be normal)
Average Reading score was 78; Average Spelling score was 75; Average Math score was 70; Average Adaptive Behavior Score was 61.
- 295 clients (over 62%) were diagnosed as having Fetal Alcohol Effects, most commonly called FAE and medically referred to as Alcohol Related Neurological Disorders and had an average IQ of 90.
Average Reading score was 84; Average Spelling score was 81; Average Math score was 76; Average Adaptive Behavior score was 67.
- Of these clients, 415 were selected for a life history questionnaire and these were the results: Mental Health Problems were by far the most prevalent secondary disability experienced over the entire age sample (90%). (Ages 3-51 years).

The following results were found for those age 12 and older:

- Disrupted school experience (defined as having been suspended or expelled from school or having dropped out of school) was experienced by 60% of the clients.
- Trouble with the law (defined as ever having been in trouble with authorities, charged or convicted of a crime) was experienced by 60% of the clients.
- Confinement (including inpatient treatment for mental health problems or alcohol/drug problems, or ever having been incarcerated for a crime) was experienced by almost 50% of the clients.
- 90 clients age 21 and older were selected for questions about self sufficiency or independent living skills.
 - 80% of the clients, age 21 and older, were not self sufficient in the areas of
 - Getting Dressed
 - Using Public Transportation
 - Personal Hygiene
 - Staying Out of Trouble
 - Structuring Leisure Time

- Cooking Meals
 - Grocery Shopping
 - Interpersonal Relationships
 - Getting Medical Care
 - Getting Social Services
 - Making Decisions
 - Managing Money
- 80% of the 90 adults age 21 and over were still having employment problems that dealt with
 - Lying
 - Problems with Supervisor
 - Anger Management
 - Unreliability
 - Social Problems
 - Poor Judgment
 - Poor Task Comprehension
 - Easy Frustration

Clients with FAE or Alcohol Related Neurological Disorders have a higher rate of ALL secondary disabilities except for mental health problems.

Incidence

The **Canadian Paediatric Society** position paper on FAS states: “Fetal alcohol syndrome (FAS) is a common yet under-recognized condition resulting from maternal consumption of alcohol during pregnancy. While preventable, FAS is also disabling.” “Health care providers play an important role in identifying babies or children with FAS. They should become familiar with the screening tools that are available to diagnose the condition in children at various ages.” “FAS diagnostic and treatment services require a multidisciplinary approach, involving physicians, psychologists, early childhood educators, teachers, social service professionals, family therapists, nurses and community support circles.”

The **Canadian Centre on Children's Research** stated that 20% of Canadian children have a serious mental health problem.

Justice studies indicate that more than half the prison population was likely exposed to high levels of alcohol prenatally. More than half were under the influence of alcohol and/or other drugs when they committed the crime for which they were incarcerated.²³ Brain injury cannot be cured with punishment.

It is estimated that perhaps 80% of children in protection by Children's Aid Societies, DFS, etc. have FASD. However, diagnosis is often withheld so that FASD does not have to be disclosed in

adoption proceedings. If they get a diagnosis, they have to disclose or face lawsuits. If they do disclose, it could reduce the number of potential adoptive parents for that child. If they don't get a diagnosis, they don't have to disclose and the child could be easier to adopt out, and the agency may avoid paying adoption subsidies. Unfortunately, it also means the proper interventions are not done and the child and family deal with years of frustration, heartache and personal and financial disaster. Foster parents have been threatened with dismissal if they take a ward in for FASD diagnosis.

Fifty years ago, the majority of children placed for adoption came from healthy young teens that "got into trouble" and became pregnant. The social stigma of being an unwed mother and the lack of financial supports were serious problems. Today the social stigma has virtually disappeared and many babies born to unwed young mothers are raised by their mother and the grandparents in the family home. The availability of proactive and retroactive birth control has also made a difference.

Today, a very large percentage of children in care have been removed from abusive homes, usually involving alcohol and other drugs. Most of these children have been prenatally exposed to high levels of alcohol and will pay the price for a lifetime. Often, these are children who are difficult to place and who grow up bouncing through many, many foster homes. They start with serious primary disabilities and become adults with many acquired secondary disabilities.

Education System

Studies of student populations are particularly valuable as virtually all children are eligible and required to be enrolled in the education system, and there are longitudinal data identifying academic, behavioural, medical, social and environmental variables. Ontario now regulates the minimum school leaving age as age 18.

A more detailed review of the information in the student School Records would be instructive.

Lambton Kent District School Board

Typical of school boards in Canada, Ontario's Lambton Kent District School Board (urban / rural mix) with 28,000 Elementary and Secondary School students has 6,000 students (**21.4%**) receiving services from the Special Education Department. While not all the individuals with disabilities are identified as the disabilities having been caused by prenatal exposure to alcohol, the vast majority of the disabilities are of types known to be caused by prenatal alcohol exposure.

Results of prenatal exposure to alcohol can include Neurological, Physical, Behavioural and Social issues. Compare the following "Exceptionalities" accepted by the Ontario Ministry of Education with the "Results of Prenatal Alcohol Exposure" above.

This is not surprising as it is known from this study that 37% of students have been prenatally exposed to multiple exposures of binge drinking of 5 or more standard alcoholic drinks per occasion and a further 42% have been exposed to episodes of 1 to 4 drinks per occasion. We also know that 15% to 18% of pregnant women continue to drink throughout the pregnancy, 4% at very high levels.

Exceptionalities ¹⁹

The following five categories of exceptionalities have been identified in the Ontario Education Act definition of exceptional pupil:

- behaviour
- communication
- intellectual
- physical

- multiple

These broad categories include the following definitions, as clarified in the memo to school boards of January 15, 1999:

Behaviour

A learning disorder characterized by specific behaviour problems over such a period of time, and to such a marked degree, and of such a nature, as to adversely affect educational performance, and that may be accompanied by one or more of the following:

- a) an inability to build or to maintain interpersonal relationships;
- b) excessive fears or anxieties;
- c) a tendency to compulsive reaction;
- d) an inability to learn that cannot be traced to intellectual, sensory, or other health factors, or any combination thereof.

Communication

Autism

A severe learning disorder that is characterized by:

- a) disturbances in:
 - rate of educational development;
 - ability to relate to the environment;
 - mobility;
 - perception, speech, and language;
- b) lack of the representational symbolic behaviour that precedes language.

Deaf and Hard-of-Hearing

An impairment characterized by deficits in language and speech development because of a diminished or non-existent auditory response to sound.

Language Impairment

A learning disorder characterized by an impairment in comprehension and/or the use of verbal communication or the written or other symbol system of communication, which may be associated with neurological, psychological, physical, or sensory factors, and which may:

- a) involve one or more of the form, content, and function of language in communication; and
- b) include one or more of:
 - language delay;
 - dysfluency;
 - voice and articulation development, which may or may not be organically or functionally based.

Speech Impairment

A disorder in language formulation that may be associated with neurological, psychological, physical, or sensory factors; that involves perceptual motor aspects of transmitting oral messages; and that may be characterized by impairment in articulation, rhythm, and stress.

Learning Disability

A learning disorder evident in both academic and social situations that involves one or more of the processes necessary for the proper use of spoken language or the symbols of communication, and that is characterized by a condition that:

a) is not primarily the result of:

- impairment of vision;
- impairment of hearing;
- physical disability;
- developmental disability;
- primary emotional disturbance;
- cultural difference;

b) results in a significant discrepancy between academic achievement and assessed intellectual ability, with deficits in one or more of the following:

- receptive language (listening, reading);
- language processing (thinking, conceptualizing, integrating);
- expressive language (talking, spelling, writing);
- mathematical computations; and

c) may be associated with one or more conditions diagnosed as:

- a perceptual handicap;
- a brain injury;
- minimal brain dysfunction;
- dyslexia;
- developmental aphasia.

Intellectual

Giftedness

An unusually advanced degree of general intellectual ability that requires differentiated learning experiences of a depth and breadth beyond those normally provided in the regular school program to satisfy the level of educational potential indicated.

Mild Intellectual Disability

A learning disorder characterized by:

- a) an ability to profit educationally within a regular class with the aid of considerable curriculum modification and supportive service;
- b) an inability to profit educationally within a regular class because of slow intellectual development;
- c) a potential for academic learning, independent social adjustment, and economic self-support.

Developmental Disability

A severe learning disorder characterized by:

- a) an inability to profit from a special education program for students with mild intellectual disabilities because of slow intellectual development;
- b) an ability to profit from a special education program that is designed to accommodate slow intellectual development;
- c) a limited potential for academic learning, independent social adjustment, and economic self-support.

Physical

Physical Disability

A condition of such severe physical limitation or deficiency as to require special assistance in learning situations to provide the opportunity for educational achievement equivalent to that of pupils without exceptionalities who are of the same age or development level.

Blind and Low Vision

A condition of partial or total impairment of sight or vision that even with correction affects educational performance adversely.

Multiple

Multiple Exceptionalities

A combination of learning or other disorders, impairments, or physical disabilities that is of such a nature as to require, for educational achievement, the services of one or more teachers holding qualifications in special education and the provision of support services appropriate for such disorders, impairments, or disabilities.

Conclusions

37% of babies have been exposed to multiple episodes of binge drinking (5+ drinks per session) during pregnancy. An additional 42% have been multiply exposed to 1 to 4 drinks per session during pregnancy. Prenatal alcohol exposure has been linked to more than 60 disease conditions, birth defects and disabilities. Damage is a diverse continuum from mild intellectual and behavioural issues to profound disabilities or premature death. Prenatal alcohol damage varies due to volume ingested, timing during pregnancy, peak blood alcohol levels, genetics and environmental factors. Acute ethanol produces a global effect on the neuro-metabolome. Ethanol was found to interact with over 1000 genes and cell events, including cell signalling, transport and proliferation.

Approximately 20% of Canadian school age children are receiving special education services, most for conditions of the types known to be caused by prenatal alcohol exposure. As FASD is a diverse continuum, issues range from almost imperceptible to profound. It is somewhere in the middle that

the issues attract the attention of parents, educators, medical and social work professionals, and the justice system. Most of the issues that attract sufficient attention are behavioural issues. "The most outstanding characteristics of FAS are bad judgment and the inability to make the connection between an act and its consequences." ¹³

It is likely that between 10% and 15% of children are significantly enough affected by prenatal alcohol exposure to require special education. As they become adults, FASD does not disappear but the issues of youth translate into ongoing problems in family relationships, employment, mental health and justice conflicts. The cost to the individuals affected, their families and society are enormous and as a society, we cannot afford to ignore them. To ignore the facts does not change the facts.

The Author

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Bruce is a single father, the biological and adoptive parent of David, now age 16, diagnosed with Fetal Alcohol Syndrome as an infant. Bruce and David's birth mother, a family physician (deceased in 1999), separated when David was 4 months old. He has been David's primary caregiver since birth. David is now in Grade 11 in a regular classroom, with resource supports. Although there are still many challenges, early diagnosis and intensive intervention have clearly worked.

Bruce is the recipient of the St. Michael's Hospital "Award for Pioneer Work in the Area of Fetal Alcohol Spectrum Disorder". "St. Michael's Hospital, Fetal Alcohol Spectrum Disorder Clinic is pleased to support the work of FASlink and views FASlink as an essential service for our clients. We are fortunate to partner with FASlink in our attempt to improve the lives of individuals and their families with FASD. - Dr. Brenda Stade" St. Michael's Hospital is a teaching hospital affiliated with the University of Toronto.

Bruce was a founding director of the Fetal Alcohol Support Network in 1991 and was one of the first members of CCSA's FASlink. In early 1999, the Canadian Centre for Substance Abuse could no longer fund FASlink. Rather than let this critical support system end, Bruce took it over and provided the hardware, software and Internet services.

FASlink has become the primary Canadian Fetal Alcohol Spectrum Disorders research, information, support, advocacy and communications resource. FASlink serves parents (birth, foster, adoptive and grandparents), caregivers, adults with FASD, doctors, teachers, social workers, lawyers, students and government policy makers across Canada and worldwide. FASlink's Internet Home Page serves more than 400,000 people annually in addition to countless on-line searches of the more than 110,000 FASD related documents in the FASlink Archives. FASlink is the top listing on Google for the term "fetal alcohol". FASlink does not accept funding from the beverage alcohol industry.

Bruce designs knowledge management systems and is a life-long advocate for children's issues. He publishes the FASlink website, CD's and other educational material and is Moderator of the very active on-line discussion forum, sharing 25 to 100 letters daily with the members. He also deals with many direct queries from the general public and speaks regularly at seminars and conferences.

He has operated his own technology based businesses since 1972, established precedents in family law and courtroom procedure, was a charter member of Family Mediation Canada, and is a published researcher, author and musician. He has served for many years on School Councils and has been

active in youth services, such as Scouts Canada and Harmony & Music Education for Youth, as well as serving on the Board of Directors of the International Symphony Orchestra.

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