

All couples planning their families should have a [three-generation family history](#) taken, ideally in the preconception period. Attention should be paid to the red flags in Box 1 to assess risk to future offspring.

A personal or family history of:

- congenital anomaly e.g. congenital heart defect, neural tube defect
- intellectual disability or developmental delay
- genetic syndrome e.g. neurofibromatosis, Noonan syndrome
- chromosomal disorder e.g. Down syndrome (trisomy 21), familial translocation
- muscular disorder e.g. X-linked Duchenne and Becker muscular dystrophies
- bleeding disorder e.g. X-linked hemophilia A or B
- stillbirth
- sudden unexplained death
- other major health concerns such as cardiomyopathy, neurological disease, epilepsy, hearing loss, autism, and psychiatric disorders
- [consanguinity](#)

### Box 1. Personal and family history red flags that should prompt a referral for genetic consultation, ideally when individuals are planning a family (preconception).

A history of any of these red flags should prompt [referral for genetic consultation](#). Individuals and their partners should be encouraged to make their best efforts to obtain confirmatory information such as medical records, genetic test results, even family photos.

One's ethnicity is an important piece of risk assessment as some populations are known to have a higher incidence of certain genetic conditions due to a **founder effect**. [Founder effect](#) confers reduced genetic diversity in a population descended from a small number of ancestors. A [founder mutation](#) refer to a specific pathogenic genomic variation in a specific population due to the presence of that genomic variation in a single or small number of ancestors.

Other considerations:

- There is a higher incidence of **hemoglobinopathies** in certain populations, screening recommendations [can be found here](#)
- Canadian recommendation for reproductive carrier screening in individuals of **Ashkenazi Jewish** ethnicity are on page 2, and those from certain **regions of Quebec** [can be found here](#)
- Canadian carrier screening recommendations for **cystic fibrosis**, **fragile X syndrome** and **spinal muscular atrophy** [can be found here](#).
- Individuals who are of Cree ancestry have a higher carrier frequency of **Cree encephalitis** (1/30-1/17) and **Cree Leukoencephalopathy** (~1/10). Screening programs have been developed in some regional communities. The [CE-CLE Screening Program](#) is offered to adults in the Awash clinics and to high school students.
- **Aboriginal Manitoba** populations have a higher incidence of [cerebro-oculo-facio-skeletal syndrome](#)
- **Newfoundland** populations have a higher incidence of [Bardet Biedl syndrome](#) and [neuronal ceroid lipofuscinosis](#).
- A maternal family history of bleeding disorders in a woman's male relatives (father, brother, and/or maternal uncles) should [prompt referral](#) for consideration of carrier screening of **X-linked hemophilia**.
- Families **Amish**, **Mennonite**, or **Hutterite** background based on family history and/or geographic or religious settlement locality, in addition to a three-generation family history, should [be offered referral](#) for genetic consultation.

**Expanded carrier testing** is privately available genetic testing which screens an individual for more than just guideline/ethnicity-based conditions. See our [Education Module](#) for more information on this type of testing.

**POINT OF CARE TOOL**

**Table 1. Canadian recommendations for reproductive carrier screening of individuals who are of Ashkenazi Jewish (AJ) ethnicity.** Ashkenazi Jews are descendants of the Jewish communities of Germany, Poland, Austria and Eastern Europe. For genetics purposes, an individual with one biological grandparent of Ashkenazi Jewish heritage is considered a candidate for carrier screening.

**References and Resources:**

Condition	Carrier frequency	Screening recommendations
Tay-Sachs disease	1/30	DNA-based analysis is recommended for: ✓ all at-risk couples
Canavan disease	1/37-1/53	DNA-based analysis is recommended for: ✓ all at-risk couples
Familial dysautonomia	1/32	DNA-based analysis is recommended for: ✓ all at-risk couples

When only one member of a couple is of AJ ethnicity, the non-AJ partner should be screened for Tay-Sachs disease, using biochemical hexosaminidase enzyme activity since available DNA testing targets specific pathogenic variants found in AJ populations (*founder mutations*).

No screening for Canavan Disease and Familial Dysautonomia is recommended as both are very rare in the general population.

Some provinces offer carrier screening panels that include more than the three conditions above. [See here for more on testing in your province.](#)

Screening for other genetic conditions where common pathogenic variants are known can also be considered, particularly when there is a positive family history, for example:

Condition	Carrier frequency	Screening recommendations
Gaucher disease	1/18	If there is a positive family history, consider screening by DNA-based targeted analysis (ideally for the familial pathogenic variant, although gene panels with common AJ pathogenic variants may be considered).
Cystic fibrosis (CF)	1/24	
Fanconi anemia group C	1/89	
Niemann-Pick type A	1/90	
Mucopolipodosis type IV	1/100	
Bloom syndrome	1/104	

When only one member of a couple is of AJ ethnicity, the decision to screen the couple should consider the frequency of the condition and the availability of reliable screening in the non-AJ partner.

E.g. Where there is a positive family history of CF and one member of a couple is of AJ ethnicity and the other member of the couple is of Northern European ethnicity; offering carrier screening for CF to this couple is reasonable. However, offering screening for a family history of the rare Bloom syndrome would not be recommended as the carrier frequency and utility of screening in non-AJ individuals is unknown.

- [Wilson RD, De Bie I, Armour CM, et al. Joint SOGC-CCMG Opinion for Reproductive Genetic Carrier Screening: An Update for All Canadian Providers of Maternity and Reproductive Healthcare in the Era of Direct-to-Consumer Testing. J Obstet Gynaecol Can 2016;38\(8\):742-762.e3](#)
- [The National Council of Jewish Women of Canada](#)
- [Jewish Genetic Disease Consortium](#)