X Chromosome Inactivation (XCI): The epigenetic process which silences one X chromosome in females to achieve gene dosage balance between males and females. [1]

Xa: the active X chromosome

Xi: the inactive X chromosome

Xm: maternally inheritted X chromosome
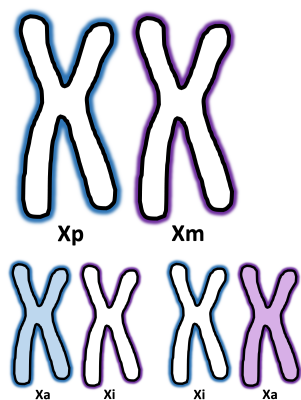
Xp: paternally inheritted X chromosome

Figure 1: The paternally inherited (Xp) chromosome in and the maternally inherited chromosome (Xm). *The active chromosome Xa is represented with color filled in, while the inactive chromosome Xi is represented with no color fill.*

Escape: The status of genes which are expressed on Xi. These genes "escape" inactivation.

Inactive: The status of genes which are suppressed on Xi.

Variable: The status of genes which are expressed on Xi in some tissues/individuals, but not in all tissues/individuals. [2]

Mosaicism: Xa and Xi are typically randomly assigned to either Xp or Xm in each cell. *Mosaicism* refers to the heterogeneity of Xa/Xi assignment among a set of cells.
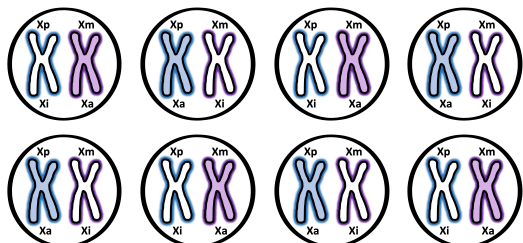

Figure 2: Mosaicism. *A sample of six cells with differences in Xa/Xi assignments.*

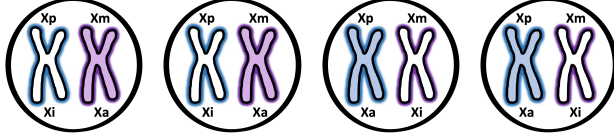**Skew**: A ratio which represents the mosaicism of Xa/Xi assignment in a set of cells.

Figure 3a: Skew Ratio 1. *Two samples have Xi assignment on Xm, while two samples have Xi assignment on Xp. The resulting skew ratio is 50:50.*
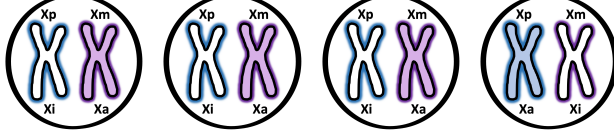

Figure 3b: Skew Ratio 2. *Three samples have Xi assignment on Xm, while one sample has Xi assignment on Xp. The resulting skew ratio is 25:75.*
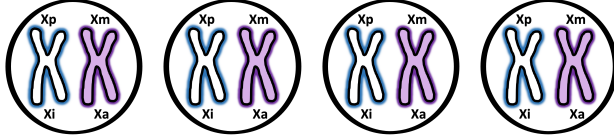

Figure 3c: Skew Ratio 3. *All four samples have Xi assignment on Xm.*
The resulting skew ratio is 0:100. This is a rare occurrence in nature,
and is often referred to has non-random assignment or fully skewed [3]

%Xi or tau (τ): The ratio of a gene's expression on Xi over its total expression across both Xa and Xi, referred to as %Xi [4] or τ [5]. In allele specific expression (ASE) based methods for escape inference, τ is compared to the skew ratio. Significant deviation of τ from the skew ratio reflects biallelic expression and classifies a gene as escape.

$N = expression\ level$

$j = gene$

$i = inactive\ x\ chromosome$

$a = active\ x\ chromosome$

$\tau = \frac{N_{ij}}{N_{aj} + N_{ij}}$

A note about skew: For ASE based methods, data sets with a higher skew ratio (such as 25:75) are strengthened for estimating escape expression due to the lower Xi expression levels required to infer significance.

Tau+ ($\tau+$): The τ (or %Xi) values from the subset of XCI calls which were inferred from samples which were sufficiently skewed (>25:75). This subset is a more robust estimate of ASE and is strengthened for escape calling. [4]