

Microscale estimation of admixture timing

... and an example stochastic process for estimating it ... poorly.

Why admixture timing?

Genetic data can provide estimates of the timing of mating between populations.

Microscale vs macroscale



	Microscale	Macroscale
Water-wine illustration	drops of diluted wine	stream of wine entering glass
Population genetics	chromosome recombination	population migrations

Why microscale estimation?

Mating and genetic recombination are microscale events. Genetic data provides evidence about the same empirical reality as other evidence, such as distinctive archaeological cultures in nearby settlements.



References

Visit castedo.com/doc/{151,153,154}.

What to estimate

Lineal admixture time is the microscale quantity to estimate.

Definitions

lineal admixture time

the amount of time since fertilization of the first admixed individual in a lineage

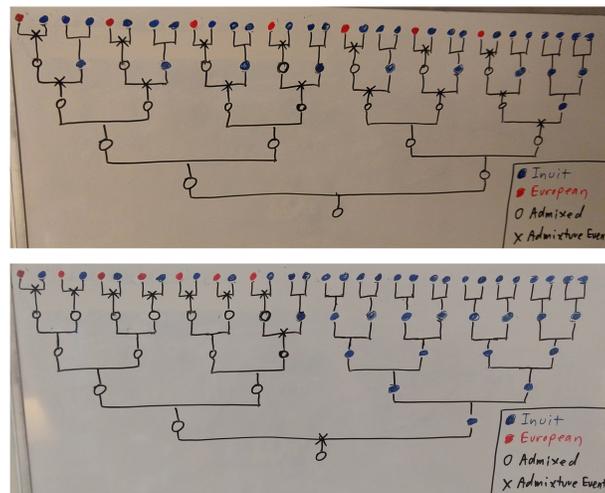
lineage

single path of descent in the genealogy of an individual

average lineal admixture time

average across all lineages of all individuals in a population

Want to know lineal admixture times for these genealogies?



Request an **amazing** demonstration of calculating lineal admixture time at this poster now!

Learn more at castedo.com/doc/151

Acknowledgements

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Example Estimator

Estimate the **average lineal admixture time** as

$$\frac{1 - \phi}{\phi} (1 - \sum_i x_i^2)$$

where

$$x_i = \frac{1 - \sqrt{1 - 4\phi(1 - \phi)\alpha_i}}{2(1 - \phi)}$$

and α_i is the frequency of alleles from the i -th ancestral group. Use

$$\phi = 1 - \frac{\beta}{2\alpha_0(1 - \alpha_0)}$$

if

- there are only two ancestral source populations and
- β is the frequency of diploid loci with dual ancestry.

Learn more at castedo.com/doc/154

Example Stochastic Process

The example estimator is precisely the expected lineal admixture time under a stochastic process with the following assumptions:

- discrete time steps
- infinite population
- proportion α_i of immigrants from i -th ancestral group
- fraction ϕ of population is new non-admixed immigrants
- random mating (excluding new immigrants)
- stationary process

The underlying random object of this stochastic process is formally defined as a *gametic lineage*. For more details, visit castedo.com/doc/153.

Further Research

- stochastic process for **good estimator**
- **software** for empirical researchers
- **data for validation** against historical evidence
- **data for new discoveries** about prehistory

Feedback & collaboration welcome!

