Plague Phylodynamics and Phylogeography

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# Plague Phylodynamics and Phylogeography

## Concepts

* Plague
* Yersinia pestis
* Phylodynamics
* Phylogeography
* Clade

## Introduction

* Introduce Plague the disease and it’s impact on Human populations.
* Introduce the pathogen, Yersinia pestis, ecotypes, subspecies, ecology, distribution. Evolutionary history and mechanisms.
* Introduce the topics phylodynamics and phylogeography and what is known so far.
* Introduce the problem.

## Results

### Curated Dataset

* Composition: Clades, Hosts, Locations, Time Periods

### Phylogeny

### Phylodynamics

Y. pestis has extreme rate variation as visualized with a Root to Tip Regression. The R2 value of 0.09 indicates a poor fit to the strict clock.

Figure 1: Root-To-Regression for All Samples

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Root to Tip Regression separated by clade is more meaningful. The regression numbers don’t make sense!

Table 1: Temporal signal statistics by clade

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Branch | Clade | Origin | R2 | p-value | Bayes Factor | Regression Rate | BETS Rate |
| 0 | 0.PRE | Ancient | 0.91 | 1.53E-04\* | 99.96 | 6.84E-08 | 4.31E-08 |
| 0 | 0.PE | Modern | 0.01 | 2.25E-01 | 35.71 | 1.94E-07 | 4.83E-09 |
| 0 | 0.ANT4 | Ancient | 0.66 | 7.84E-04\* | 24.27 | 2.52E-08 | 1.21E-08 |
| 0 | 0.ANT | Modern | -0.01 | 7.35E-01 | 32.89 | 2.73E-09 | 1.66E-08 |
| 1 | 1.ANT | Modern | 0.45 | 2.03E-01 | 18.13 | 5.83E-08 | 2.19E-08 |
| 1 | 1.IN | Modern | 0.0 | 3.24E-01 | 21.97 | 4.22E-08 | 3.42E-08 |
| 1 | 1.ORI | Modern | 0.04 | 1.32E-02\* | 78.92 | 2.50E-08 | 5.46E-08 |
| 1 | 1.PRE | Ancient | 0.76 | 1.68E-13\* | 4.05 | 6.29E-08 | 5.46E-08 |
| 2 | 2.ANT | Modern | 0.05 | 5.96E-02 | 1.60 |  | 1.60E-08 |
| 2 | 2.MED | Modern | 0.01 | 1.86E-01 |  |  |  |
| 3 | 3.ANT | Modern | -0.04 | 4.39E-01 |  |  |  |
| 4 | 4.ANT | Modern | -0.11 | 8.80E-01 |  |  |  |
| All | All | Modern+Ancient | 0.09 | 3.81E-14 |  |  |  |

## Conclusion