**Parameter:** Rate of neurosyphilis development by stage

**Value:**

* Primary/secondary: ~0.04
* Early latent: ~0.01

**Reference:** De Voux A, Kidd S, Torrone EA. Reported cases of neurosyphilis among early syphilis cases—United States, 2009 to 2015. Sexually transmitted diseases. 2018 Jan 1;45(1):39-41.

<https://journals.lww.com/stdjournal/FullText/2018/01000/Reported_Cases_of_Neurosyphilis_Among_Early.9.aspx>

**Summary:**

* Among cases reported in 2015 in 10 states, provided percentage with either confirmed or probable neurosyphilis by stage
  + Primary: 0.3%
  + Secondary: 1.1%
  + Early latent: 0.8%
* Using the formula of rate = (-ln(1-prob))/time, we get the following rates:
  + Primary
    - Assuming time = 1 month
    - rate: (-ln(1-.003))/(1/12) =
      * **primary 🡪 0.03605411**
  + Secondary
    - Assuming time = 3 months
    - rate: (-ln(1-.011))/(3/12)
      * **secondary 🡪 0.04424379**
  + Early latent
    - Assuming time = 8 months
    - rate: (-ln(1-.008))/(8/12)
      * **early latent 🡪 0.01204826**

From Parastu’s notes:

Golden (2003) & Kent (2008) estimate that 25–60% of patients experience CNS invasion during the primary and secondary stages, with 5% of these cases being symptomatic. This results in an estimated [1.25–3%] of patients experience symptomatic CNS disease during the primary and secondary stages (2, 7)

* Final rate: $rate.cns.primary.secondary (0.05 - 0.122)