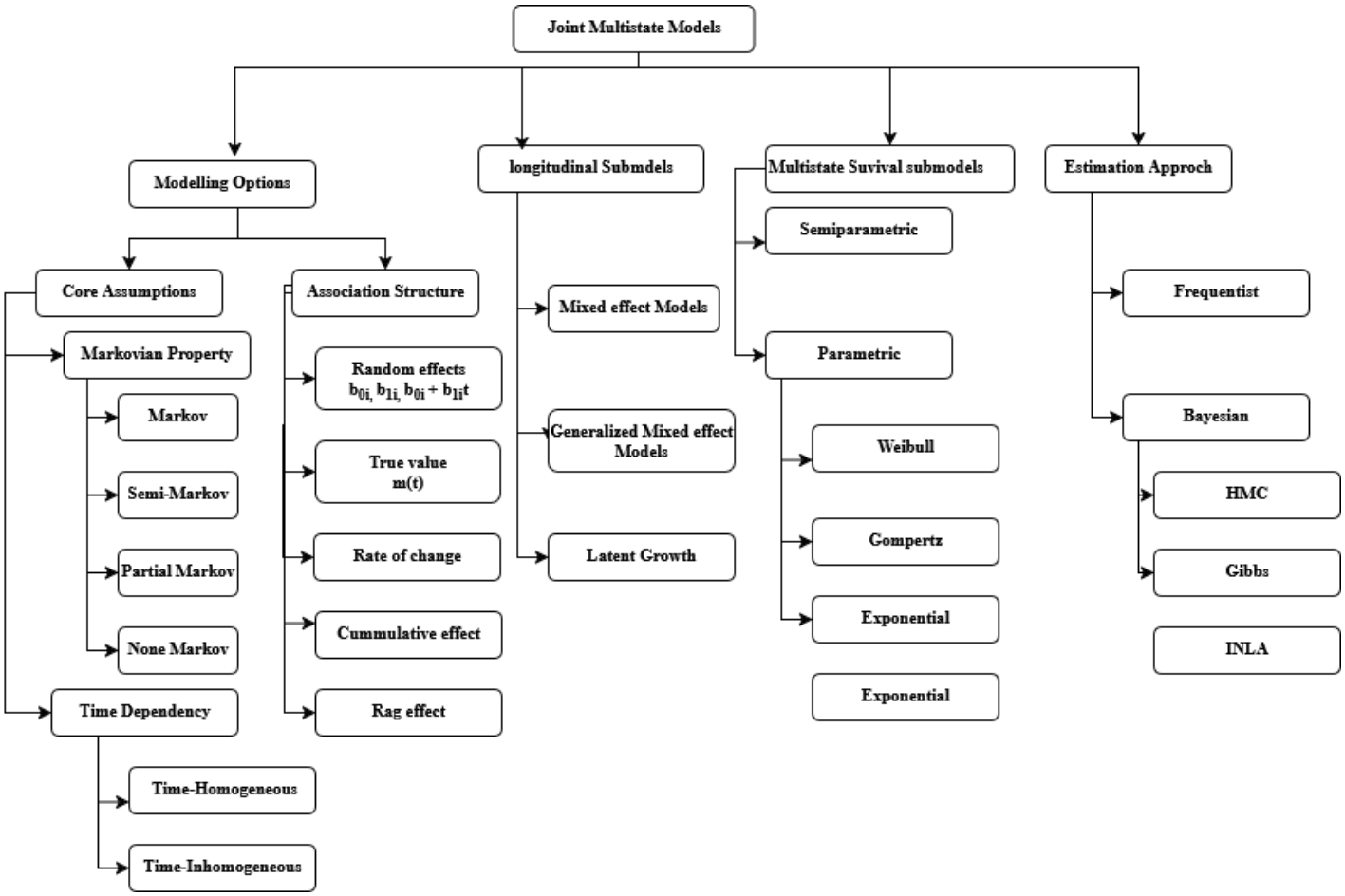
Summary of Joint Multistate Model Components



1. **Markov Property**
   - *Markov:* Assumes transition intensities depend only on the current state and time, not on the path history.
     Studies: Ferrer et al. (2016), Dessie et al. (2020), You et al. (2024), Alafchi et al. (2021, 2024), Donnelly et al. (2018)
   - *Semi-Markov:* Transition intensities depend on time since entering the current state (sojourn time).
     Studies: Dantan et al. (2011), Mwanyekange et al. (2019), Chen et al. (2024)
   - *Partial Markov:* Allows dependence on both the current state and past covariate trajectories.
     Studies: Van den Hout et al. (2015), Inoue et al. (2008)
   - *None-Markov:* No studies
2. **Time Dependency**

- *Time-Homogeneous:* Transition intensities do not vary with calendar time.
  Studies: Donnelly et al. (2018), Alafchi et al. (2024)
- *Time-Inhomogeneous:* Transition intensities change over time.
  Studies: Chen et al. (2024), Inoue et al. (2008), Van den Hout et al. (2015), Dantan et al. (2011), You et al. (2024), Mwanyekange et al. (2019), Dessie et al. (2020), Ferrer et al. (2016), Alafchi et al. (2021)

3. **Association Structure**
   - *Random Effects*: Shared latent terms (intercepts/slopes).
     Studies: Ferrer et al., Dessie et al., You et al., Alafchi et al. (2021, 2024), Van den Hout et al., Dantan et al.
   - *True Value m(t):* Uses the expected value of the biomarker.
     Studies: You et al., Van den Hout et al., Inoue et al., Chen et al.
   - *Rate of Change (Slope):* Uses the derivative of the marker.
     Studies: Ferrer et al., Dessie et al.
   - *Cumulative Effect (AUC):* Based on accumulated biomarker burden.
     Studies: Alafchi et al. (2021, 2024), Chen et al.
   - *Lag/History Effects:* No studies

4. **Longitudinal Submodels**
   - *Mixed-Effects Models:*
     Studies: Ferrer et al., Dessie et al., You et al., Alafchi et al. (2021), Donnelly et al.
   - Generalized Mixed-Effects Models:
     Studies: Alafchi et al. (2024), Chen et al. (2024), You et al. (2024)
   - Latent Growth Models:
     Studies: Van den Hout et al. (2015), Dantan et al. (2011), Inoue et al. (2008)

5. Multistate Survival Submodels
   - *Semiparametric Models:*
     Studies: Ferrer et al., Dessie et al., Alafchi et al. (2021), Donnelly et al.
   - *Parametric Models:*
     -Weibull: You et al., Chen et al., Inoue et al.
     - Gompertz: Mwanyekange et al.
     - Exponential / Piecewise: Inoue et al., Chen et al., Van den Hout et al.

6 Estimation Approaches
   - *Frequentist Methods:*
     Studies: Ferrer et al., Donnelly et al., Dessie et al., Alafchi et al. (2021)
   - *Bayesian Methods:*
     - HMC: Chen et al. (2024)
     - Gibbs: Mwanyekange et al., Van den Hout et al., Inoue et al.
     - INLA: Not used in the reviewed studies.