We develop a Dirichlet process mixture (DPM) model extension for regularly spaced longitudinal data. In longitudinal data, observations are both subject specific and a function of time. We account for both dependence between sampling densities across time and dependence in observations across time within the same subject.

In the cluster memory Dirichlet process mixture (cmDPM) model, we use the inherent clustering properties of the DPM model to carry information from one time point to the next. Observations at baseline are modeled with a DPM. Cluster assignments at future time points depend on the previous assignment. Subjects may retain their cluster membership from the previous time point with nonzero probability. After baseline, given the previous time point, subjects are no longer exchangeable and their observed values depend on their previous clustering history. Clusters that are retained over time evolve through a time dependent process. There are several ways to look at the process including as a dynamic Markov Chinese Restaurant Process. We apply the cmDPM model to model annual tuberculosis (TB) incidence rates across 197 countries in the world from 1990-2010 and examine how the annual distribution of TB incidence rates has changed over time.