*S1 File. Derivation of the distribution of time to apnea*

*In the probability space* $(Ω,F,P)$ *where* $F$ *= {1, 0}, 1 represents for apnea event and 0 for non-apnea event, the probability distribution function of time to apnea onset* $T$ *is defined as* $f\_{T}\left(x\_{\*}=k\right)=Pr[X\_{t}\left(W\right)=1|∧(X\_{1}(W)=0, …,X\_{t-1}\left(W\right)=0)$*],*$ t =1,….n$*.* $X\_{T}\left(W\right)$ *is defined as {*$∀ W, W\in Ψ, X\left(W\right)\in F$*} where* $Ψ\in L^{3}$*. At a specific non-apnea block* $x\_{\*} $*in the discretized state space, the probability of time to apnea onset* $T=i $*denoted as*$ Pr\left[x\_{\*}\right]=\left(1-P\_{k}\right)\sum\_{l\_{1}=1}^{n}…\sum\_{l\_{i-2}=1}^{n}\sum\_{l\_{i-1}1}^{n}A\_{l\_{1}}^{k}…A\_{l\_{i-2}}^{l\_{i-3}}A\_{l\_{i-1}}^{l\_{i-2}}\left(1-P\_{l\_{1}}\right)…\left(1-P\_{l\_{i-2}}\right)P\_{l\_{i-1}}, $*equal to the probability that non-apnea block* $x\_{\*}$ *evolves over* $i-1 $*non-apnea blocks and stops in an apnea block at step* $i^{th} . P=[P\_{1}….P\_{n}]$ *is the estimated probability of* $n$ *points in state space (* $L\_{1}, L\_{2}, $*and* $L\_{3}$*) to sleep apnea in 1 step and* $A^{i}=[A\_{1}^{i},….A\_{n}^{i}]$*is**transition**coefficients to all states from state* $i$*. Here, the evolution patterns over* $i-1 $*non-apnea blocks from block* $x\_{\* }$*are concatenated from the transitions of* $x\_{\*}$ *through i-1 possible blocks in the quantized state space. The probabilities of being in an apnea block one step ahead of every non-apnea block in the discretized state space is updated using one-step-ahead predictions from the DPMG model.*