Supplemental Materials

Datasets used for 4 Symptom Stochastic Progression Models								
	Random	**COVID-19 with N=55,924[1]**	**COVID-19 with N=1,099[2]**	**Severe COVID-19 with N=173[2]**	**Nonsevere COVID-19 with N=926[2]**	**Influenza with N=2,470[3]**	**MERS with N=245[4]**	**SARS with N=357[4]**
Fever	**0.500**	**0.879**	**0.887**	**0.881**	**0.919**	**0.680**	**0.841**	**0.997**
Cough	**0.500**	**0.677**	**0.678**	**0.673**	**0.705**	**0.930**	**0.633**	**0.583**
Nausea/ Vomiting	**0.500**	**0.050**	**0.050**	**0.046**	**0.069**	**0.010***	**0.151**	**0.154**
Diarrhea	**0.500**	**0.037**	**0.038**	**0.035**	**0.058**	**0.010***	**0.204**	**0.174**

*Although adult patients at times may experience vomiting and diarrhea when infected with influenza, these symptoms are rare[5]. Therefore we approximate the frequency of these symptoms as 0.010 in this case.

Supplemental Table 1 Frequencies of Four Symptoms from Various Clinical Datasets
Frequencies that were used to simulate patients for the Stochastic Progression Model of discernible symptoms.

Datasets used for 7 Symptom Stochastic Progression Models					
	COVID-19 with N=55,924[1]	COVID-19 with N=1,099[2]	Influenza with N=2,470[3]	MERS with N=245[4]	SARS with N=357[4]
Fever	0.879	0.887	0.680	0.841	0.997
Cough	0.677	0.678	0.930	0.633	0.583
Sore Throat	0.139	0.139	0.840	0.135	0.171
Headache	0.136	0.136	0.910	0.188	0.389
Myalgia*	0.148	0.149	0.940	0.400	0.591
Nausea/ Vomiting	0.050	0.050	0.010**	0.151	0.154
Diarrhea	0.037	0.038	0.010**	0.204	0.174

*For the two COVID-19 datasets myalgia is reported as myalgia or arthralgia. We assume most of these cases have myalgia and use it as the frequency for myalgia.

**Although adult patients at times may experience vomiting and diarrhea when infected with influenza, these symptoms are rare[5]. Therefore we approximate the frequency of these symptoms as 0.010 in this case.

Supplemental Table 2 Frequencies of Seven Symptoms from Various Clinical Datasets
Frequencies that were used to simulate patients for the Stochastic Progression Model of commonly observed symptoms in respiratory disease.

Initial Symptoms in MERS[6]				
	Without Pneumonia	With Pneumonia	Resipiratory Failure	Overall
Fever	0.182	0.714	0.778	0.559
Cough	0.308	0.316	0.385	0.333
Myalgia	0.385	0.526	0.154	0.378
Diarrhea	0.000	0.053	0.154	0.067

Supplemental Table 3 Initial Symptom Frequency in MERS
Frequency of symptoms reported by patient as initial in one dataset for MERS, overall and separated by eventual condition of patient.

	Initial Symptoms in SARS[7]
Fever	**0.736**
Cough or Dyspnea	**0.354**
Diarrhea	**0.063**

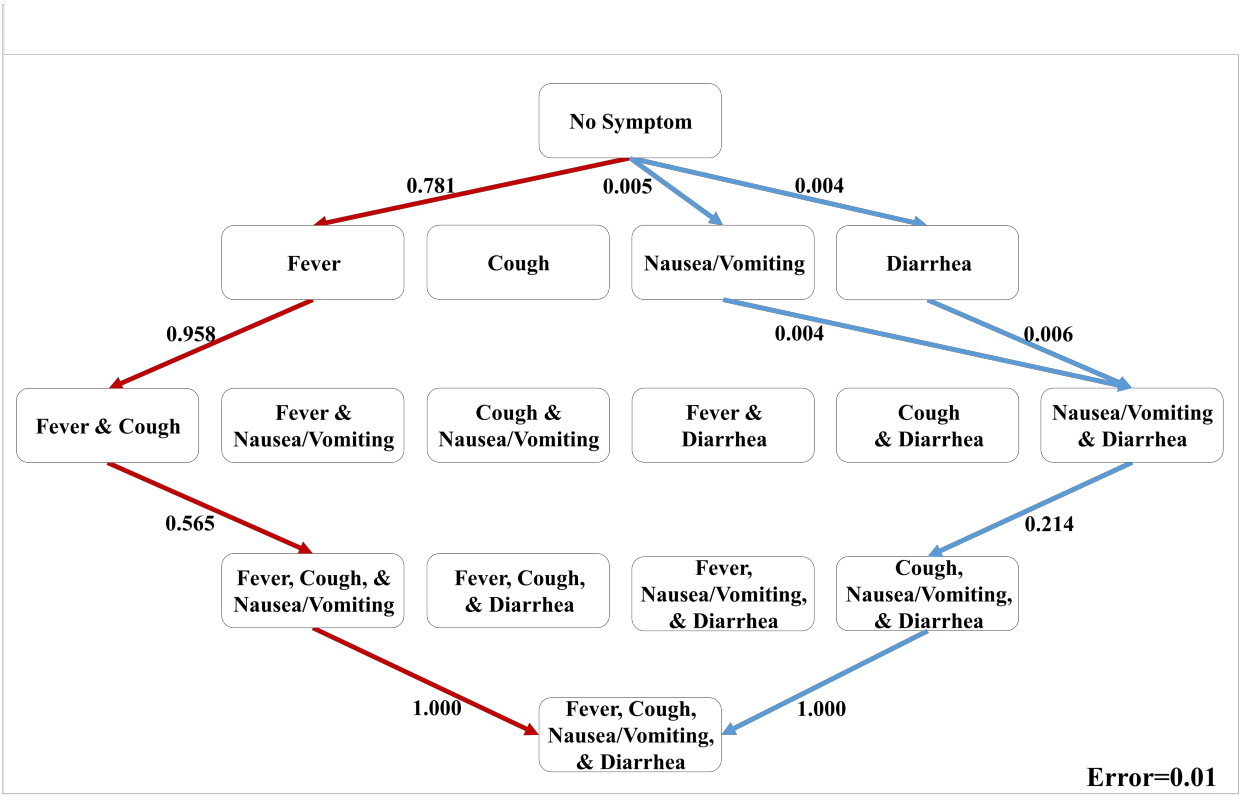
Supplemental Table 4 Initial Symptom Frequency in SARS
Frequency of symptoms reported by patient as initial in one dataset for SARS.

Datasets used for Sensitivity and Specificity Calculations			
	COVID-19 with N=138[8]	**Influenza with N=20[9]**	**Negative for Influenza with N=400[9]**
Fever	**0.986**	**0.450**	**0.183**
Cough	**0.594**	**0.750**	**0.298**
Nausea/ Vomiting*	**0.101**	**0.010****	**0.010****
Diarrhea	**0.101**	**0.010****	**0.010****

*Nausea and vomiting are reported separately for the COVID-19 dataset here. We assume most people with nausea, frequency of 0.101, have vomiting, frequency of 0.036, and therefore we use nausea's frequency here.

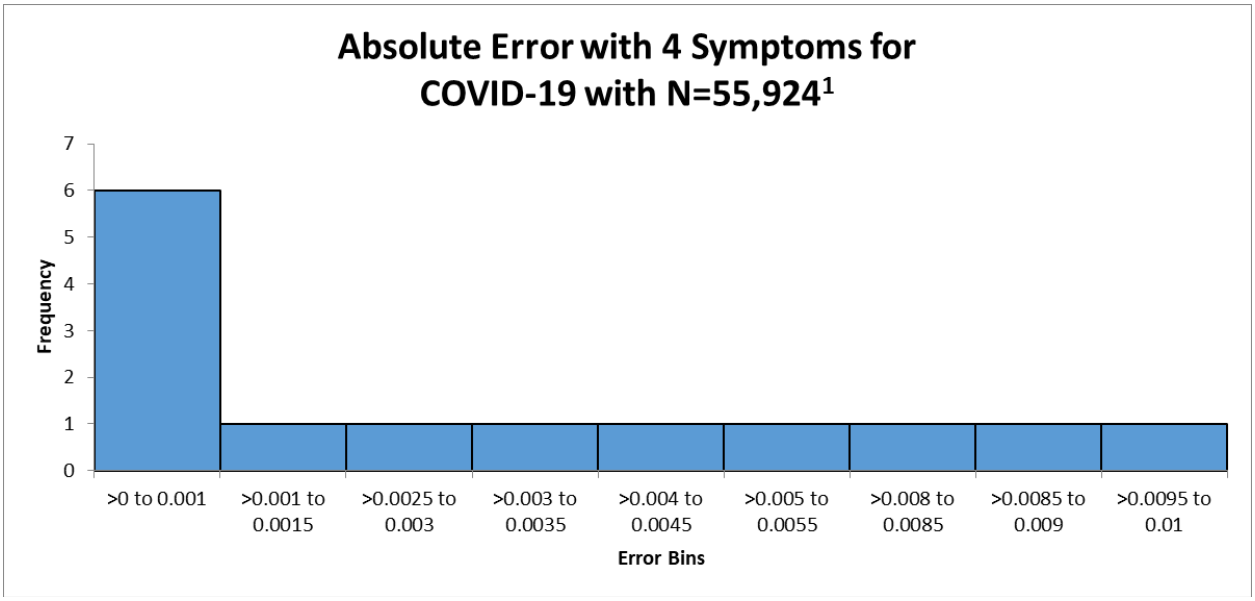
**Although adult patients at times may experience vomiting and diarrhea when infected with influenza, these symptoms are rare[5]. Therefore we approximate the frequency of these symptoms as 0.010 in this case.

Supplemental Table 5 Frequencies of Four Symptoms from Various Clinical Datasets to Determine Sensitivity and Specificity
Independent frequencies that were used to simulate patients in order to determine the sensitivity and specificity of first symptoms as early indicators.

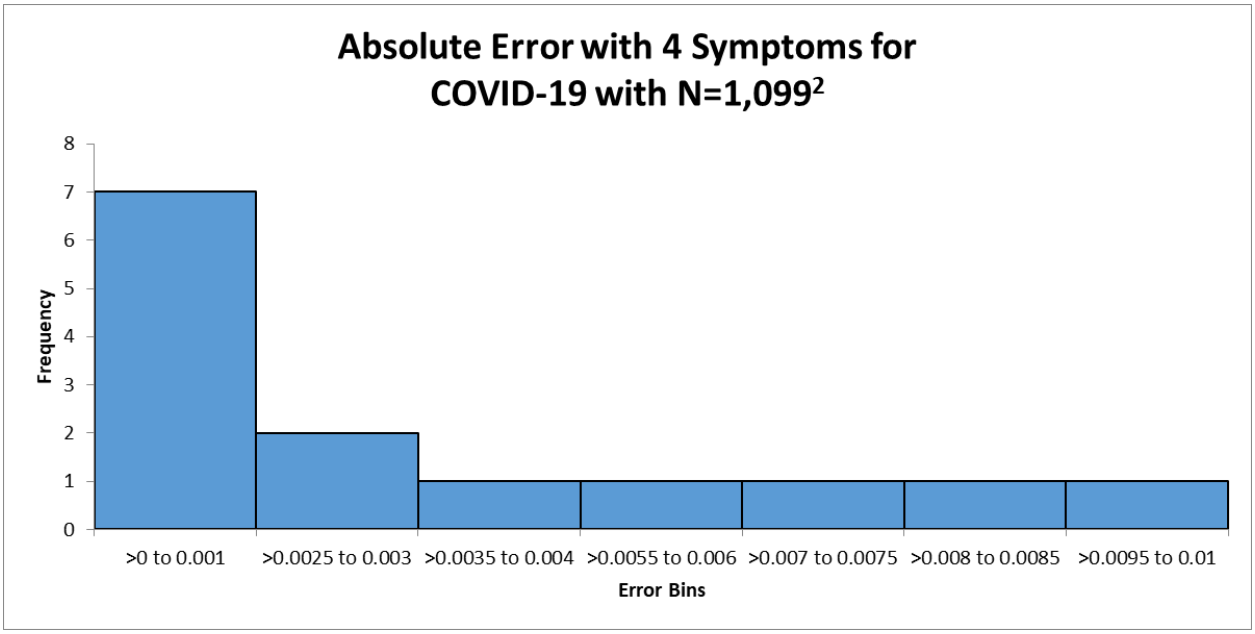


Supplemental Figure 1 Stochastic Progression Model of Four Symptoms for COVID-19 with N=1,099[2]

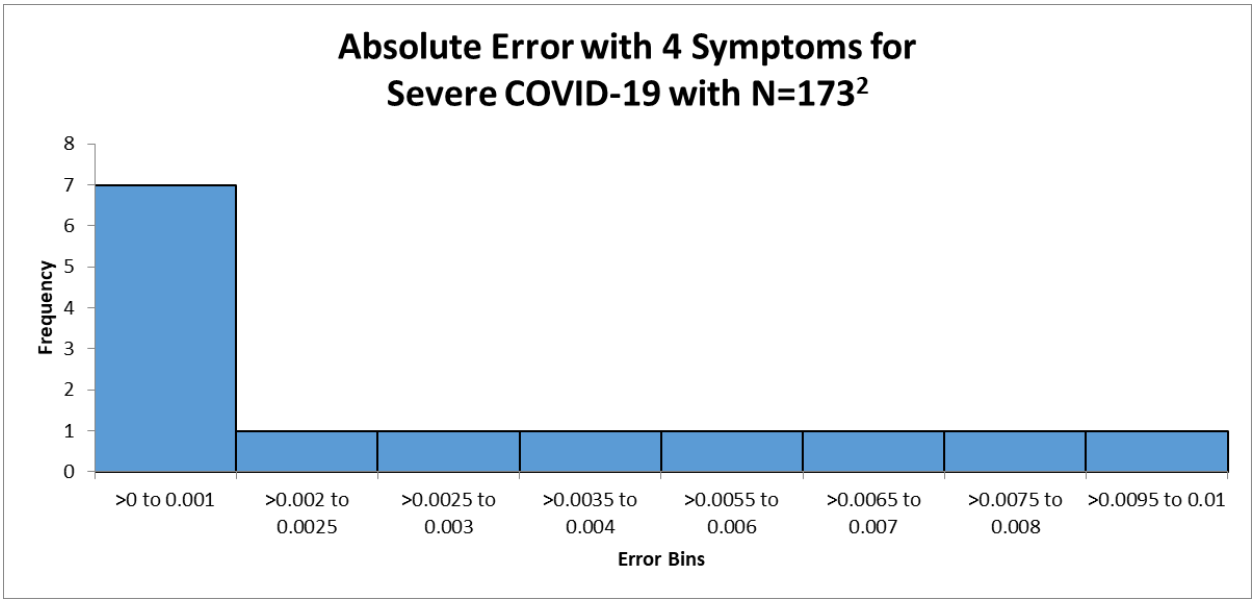
The most (red) and least (blue) likely paths of discernible symptoms for COVID-19 with N=1,099. Used as a confirmation set.



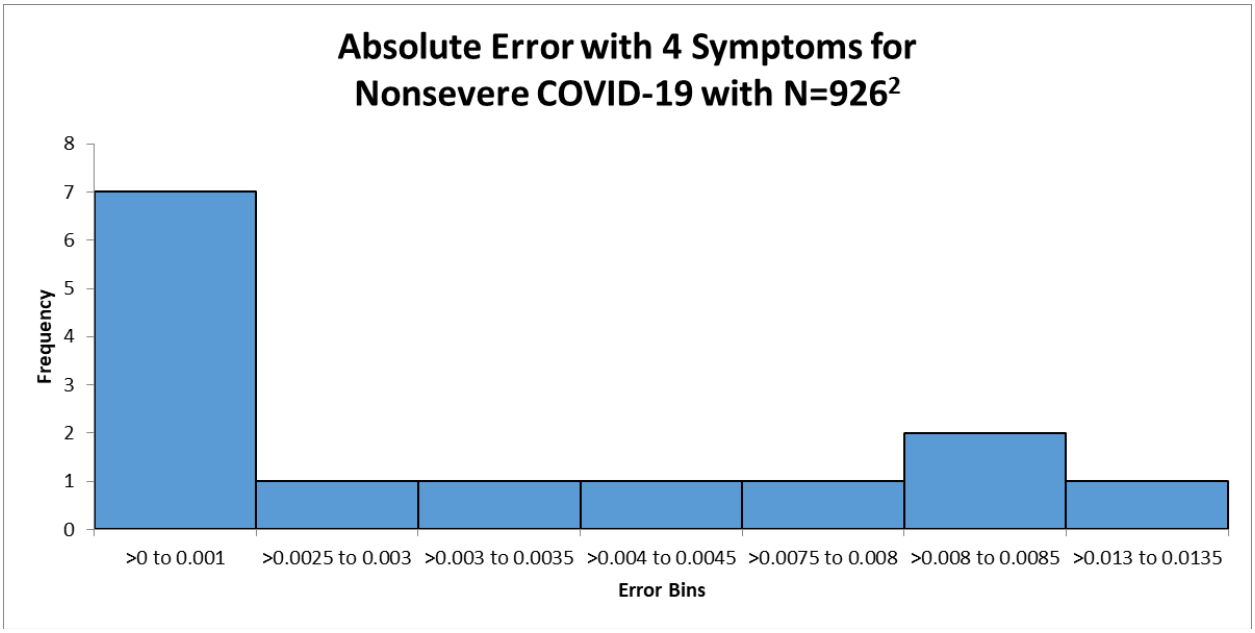
Supplemental Figure 2 Absolute Error Distribution in COVID-19 with N=55,924 for Discernible Symptoms
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.



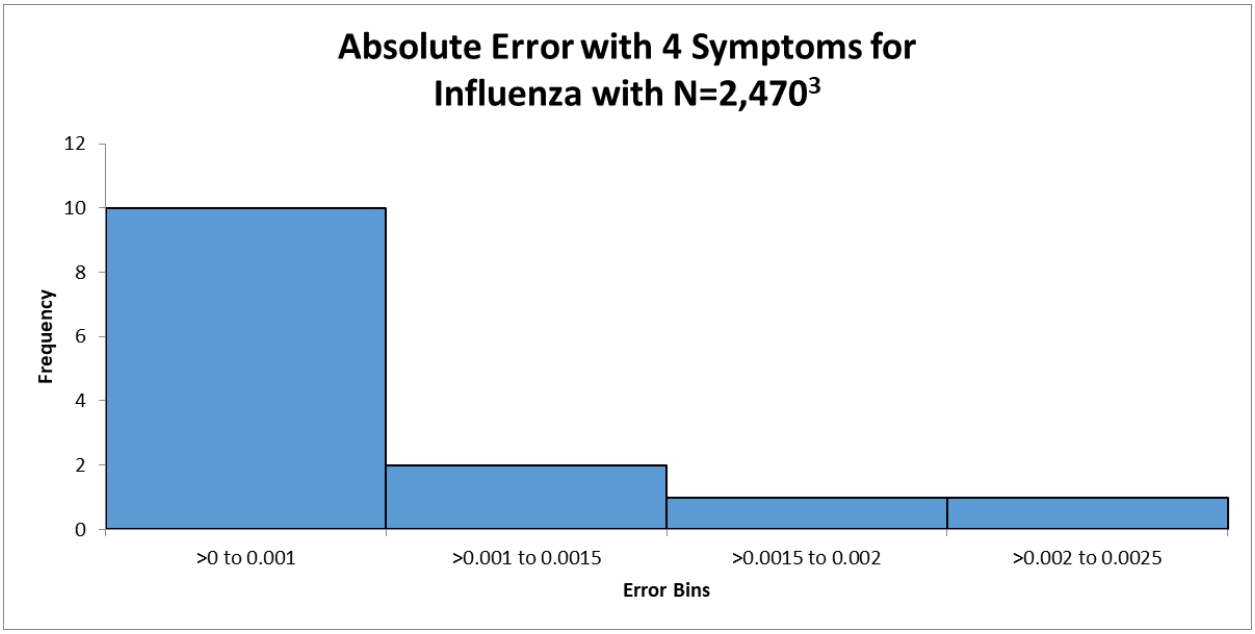
Supplemental Figure 3 Absolute Error Distribution in COVID-19 with N=1,099 for Discernible Symptoms
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.



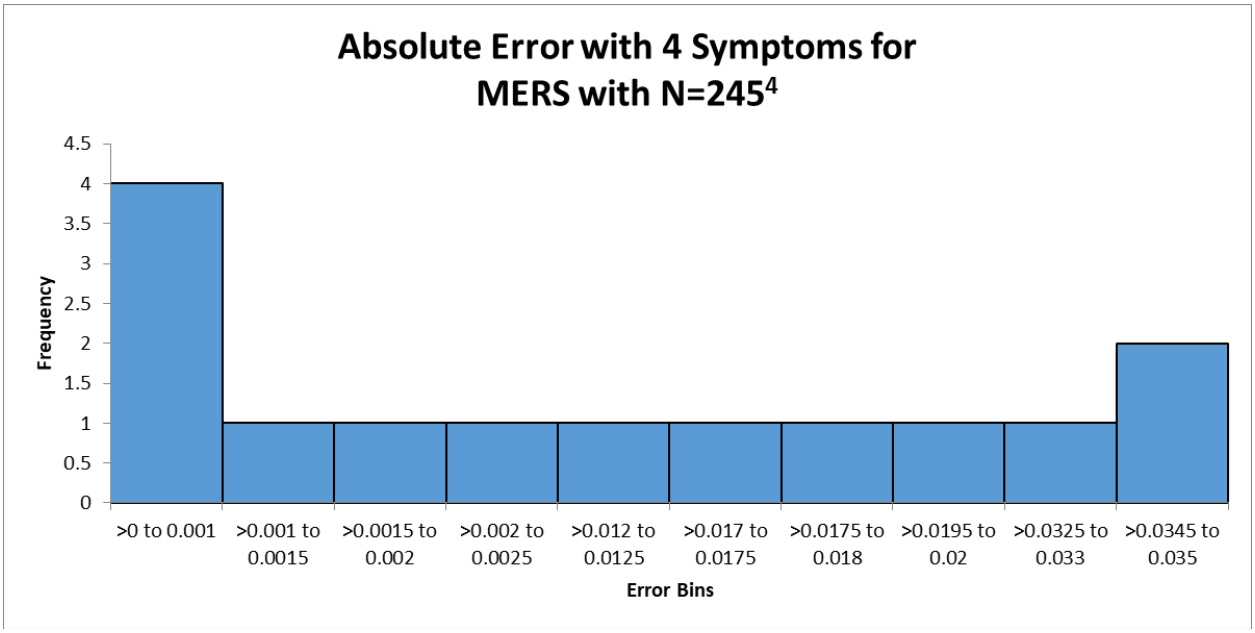
Supplemental Figure 4 Absolute Error Distribution in Severe COVID-19 with N=173 for Discernible Symptoms
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.



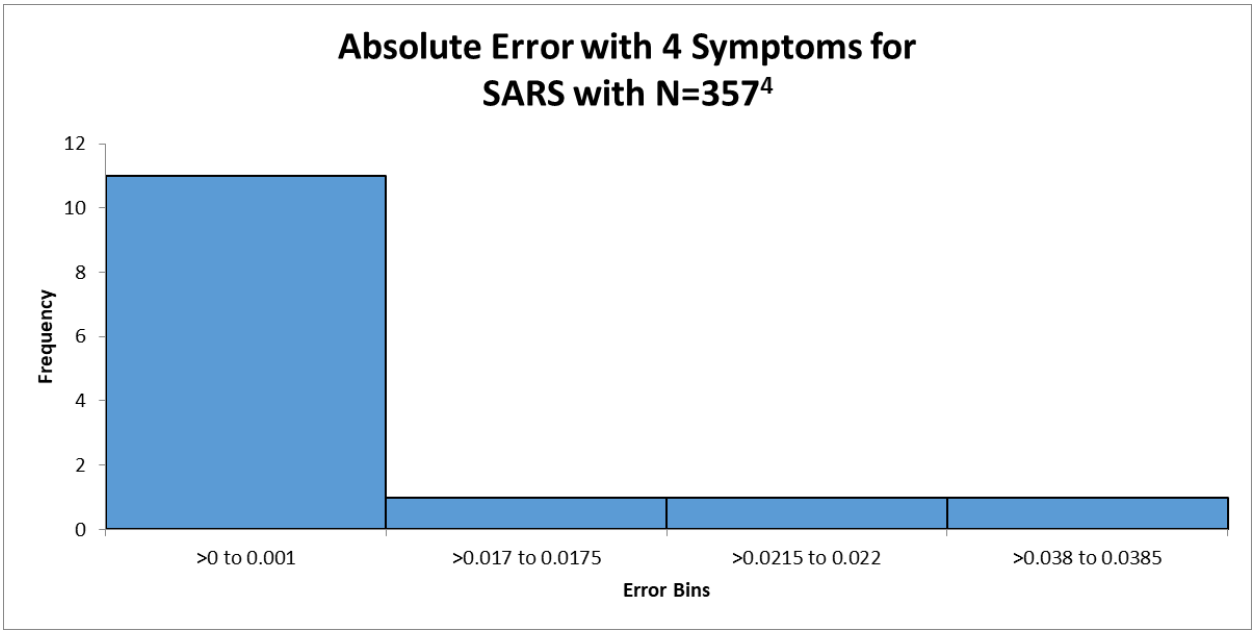
Supplemental Figure 5 Absolute Error Distribution in Nonsevere COVID-19 with N=926 for Discernible Symptoms
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.



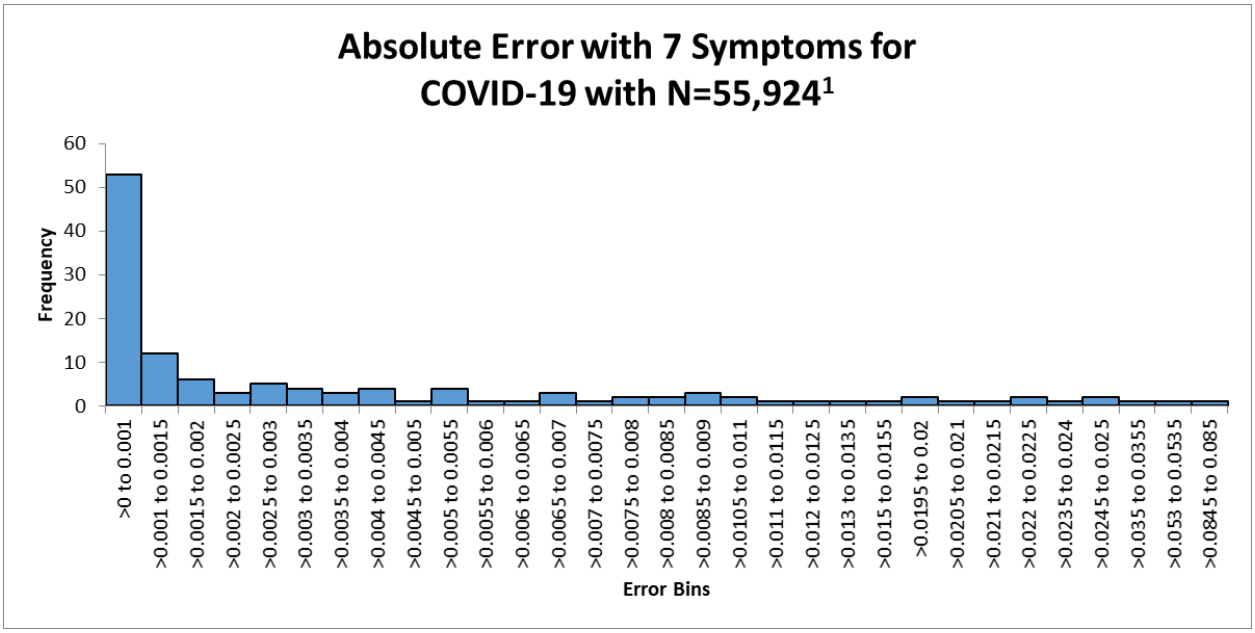
Supplemental Figure 6 Absolute Error Distribution in Influenza with N=2470 for Discernible Symptoms
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.



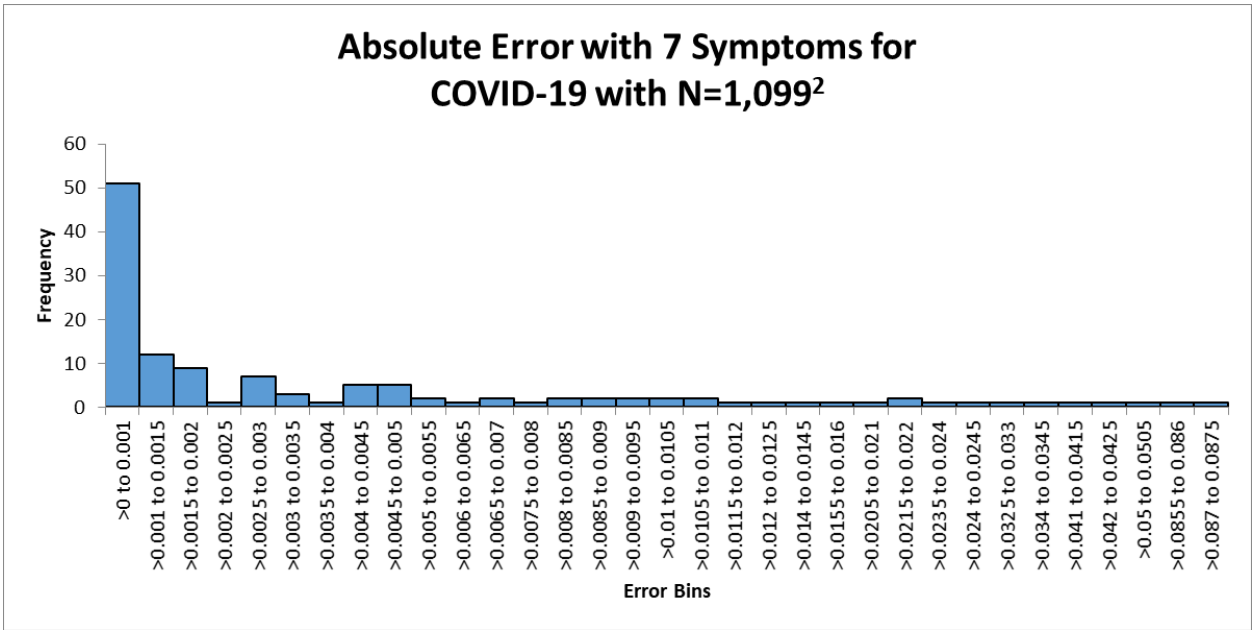
Supplemental Figure 7 Absolute Error Distribution in MERS with N=245 for Discernible Symptoms
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.



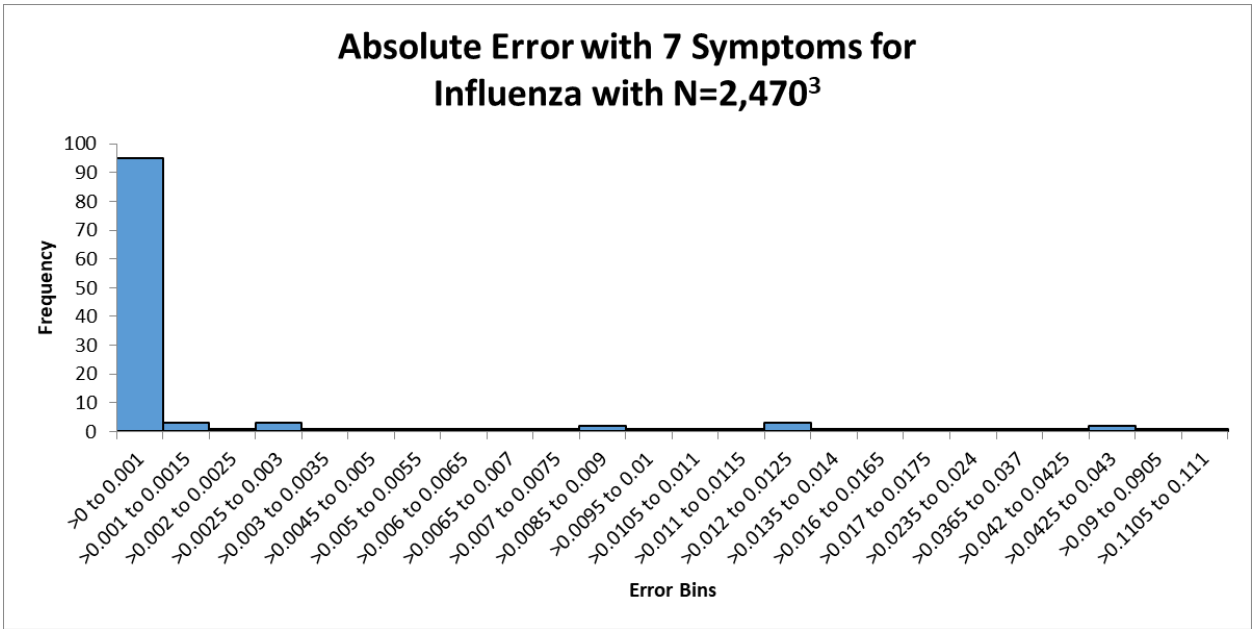
Supplemental Figure 8 Absolute Error Distribution in SARS with N=357 for Discernible Symptoms
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.



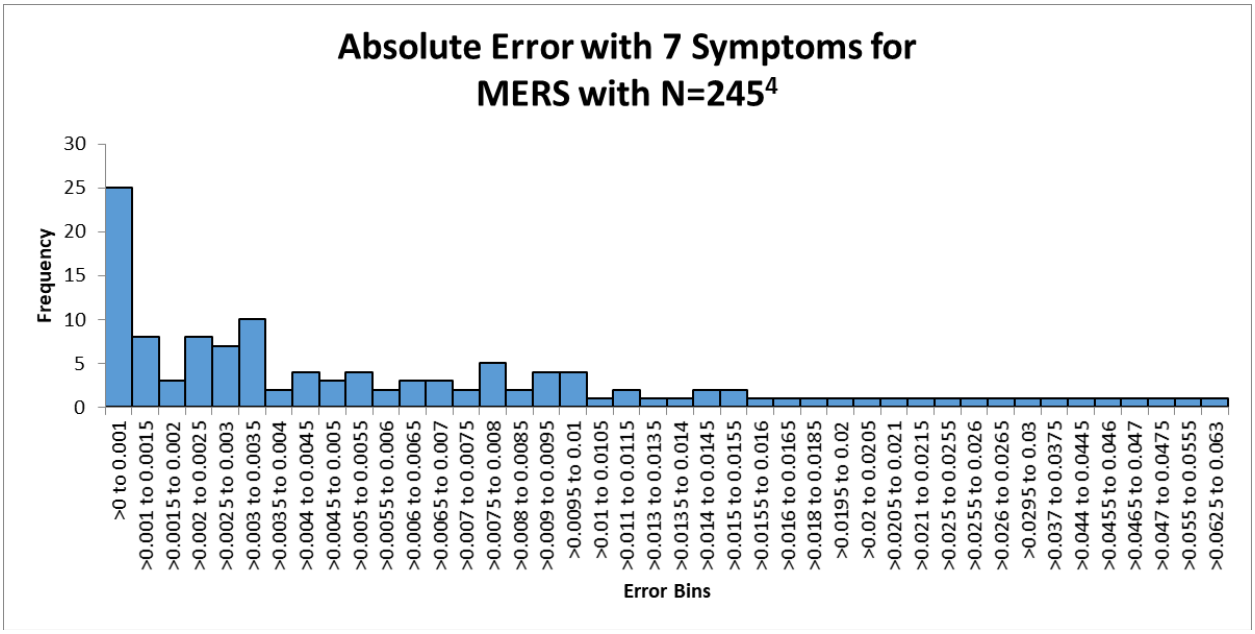
Supplemental Figure 9 Absolute Error Distribution in COVID-19 with N=55,924 for Common Symptoms in Respiratory Diseases
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.



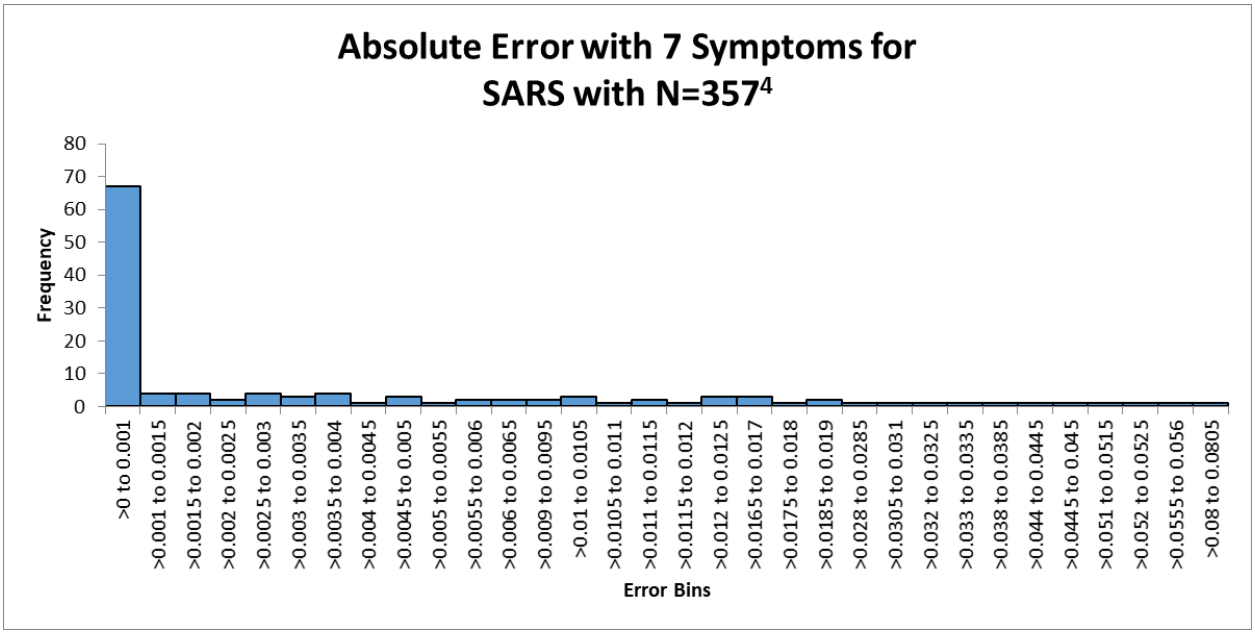
Supplemental Figure 10 Absolute Error Distribution in COVID-19 with N=1,099 for Common Symptoms in Respiratory Diseases
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.



Supplemental Figure 11 Absolute Error Distribution in Influenza with N=2,470 for Common Symptoms in Respiratory Diseases
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.



Supplemental Figure 12 Absolute Error Distribution in MERS with N=245 for Common Symptoms in Respiratory Diseases
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.



Supplemental Figure 13 Absolute Error Distribution in SARS with N=357 for Common Symptoms in Respiratory Diseases
Maximum error of this distribution was used as a conservative value to discern differences in transition probabilities for likely paths.

References

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