MRSA ABM Model Parameters

This document describes all model parameters defined in the simulation. Parameters are organized by functional category.

Sources (branch 'next'): - Defaults / editable parameters: https://github.com/WillyRay/harris-mrsa-model/blob/next/harris-mrsa-model.rs/parameters.xml - Runtime setup and usage: https://github.com/WillyRay/harris-mrsa-model/blob/next/src/builders/Builder.java - Visit / transmission logic: https://github.com/WillyRay/harris-mrsa-model/blob/next/src/agents/HealthCareWorke

Notation: Parameters marked with * are configurable via parameters.xml.

Default Values

Parameter	Value	Usage
defaultDouble	0.1	Default placeholder value for unspecified double parameters
defaultInt	1	Default placeholder value for unspecified integer parameters

Hospital Configuration

Parameter	Value	Usage
hospitalCapacity	120	Total hospital capacity (ICU + Ward beds). Used to initialize Hospital (see Builder.java)
icuCapacity	20	Number of ICU beds. Ward capacity = hospitalCapacity - icuCapacity

Admission-Discharge-Transfer (ADT) Parameters

Parameter	Value	Usage
`admissionsRate`	0.05	Mean inter-arrival time (days) for patient admissions. Used in Admission process (see Builder.java)
`icuAdmitProbability`	0.15	Probability that newly admitted patient goes directly to ICU
`dischargeShape`	1.253	Shape parameter for Gamma distribution of ward patient length of stay (days)
`dischargeScale`	0.768	Scale parameter for Gamma distribution of ward patient length of stay (days)
`icuDischargeShape`	0.916	Shape parameter for Gamma distribution of ICU patient length of stay (days)
`icuDischargeScale`	0.820	Scale parameter for Gamma distribution of ICU patient length of stay (days)
`icuTransferProbability`	0.1	Probability that ICU patient transfers to ward (vs. discharge)
`icuTransferShape`	0.5	Shape parameter for Gamma distribution of time until ICU-to-ward transfer (days)
`icuTransferScale`	1.0	Scale parameter for Gamma distribution of time until ICU-to-ward transfer (days)
`generalMortality`	0.1	General mortality probability (currently uses defaultDouble)

Therapy Needs Parameters

Parameter	Value	Usage
needsRt	0.1	Probability that ward patient needs respiratory therapy
needsPt	0.1	Probability that ward patient needs physical therapy
needsOt	0.1	Probability that ward patient needs occupational therapy
needsRtIcu	1.0	Probability that ICU patient needs respiratory therapy
needsPtIcu	0.1	Probability that ICU patient needs physical therapy (inherits from needsPt)
needsOtIcu	0.1	Probability that ICU patient needs occupational therapy (inherits from needsOt)

Healthcare Worker Visit Timing Parameters

All timing parameters are in **minutes**. Shape and scale define Gamma distributions for inter-visit times.

Parameter	Value	Usage
nurseIntraVisitShape	0.54	Shape parameter for Gamma distribution of time between nurse visits to ward patients (see Builder.java)
nurseIntraVisitScale	55.1	Scale parameter for Gamma distribution of time between nurse visits to ward patients

Parameter	Value	Usage
`nurseICUIntraVisitShape`	0.54	Shape parameter for Gamma distribution of time between nurse visits to ICU patients (see Builder.java)
`nurseICUIntraVisitScale`	20	Scale parameter for Gamma distribution of time between nurse visits to ICU patients
`doctorIntraVisitShape`	0.52	Shape parameter for Gamma distribution of time between doctor visits to ward patients (see Builder.java)
`doctorIntraVisitScale`	90.7	Scale parameter for Gamma distribution of time between doctor visits to ward patients
`doctorIcuIntraVisitShape`	0.52	Shape parameter for Gamma distribution of time between doctor visits to ICU patients (see Builder.java)
`doctorIcuIntraVisitScale`	35.3	Scale parameter for Gamma distribution of time between doctor visits to ICU patients
`specialistIntraVisitShape`	0.62	Shape parameter for Gamma distribution of time between specialist (RT/PT/OT) visits (see Builder.java)
`specialistIntraVisitScale`	61.7	Scale parameter for Gamma distribution of time between specialist visits
`roomVisitDuration`	6.6	Duration of room visit in minutes (currently defined but not actively used in code)

Staffing Ratios

These ratios determine the number of HCWs created per patient/bed.

Parameter	Value	Usage
nursesPerPatient	0.2	Ward nurses per bed. Creates (hospitalCapacity-icuCapacity)*nursesPerPatient ward nurses (see Builder.java)
physiciansPerPatient	0.2	Ward physicians per bed. Creates (hospitalCapacity-icuCapacity)*physiciansPerPatient ward doctors (see Builder.java)
icuNursesPerPatient	0.5	ICU nurses per bed. Creates icuCapacity*icuNursesPerPatient ICU nurses (see Builder.java)
icuPhysiciansPerPatient	0.3	ICU physicians per bed. Creates icuCapacity*icuPhysiciansPerPatient ICU doctors (see Builder.java)
icuRtsPerPatient	0.1	ICU respiratory therapists per bed. Creates icuCapacity*icuRtsPerPatient ICU RTs (see Builder.java)
rtsPerPatient	0.1	Respiratory therapists per total hospital capacity (see Builder.java)
ptsPerPatient	0.1	Physical therapists per total hospital capacity (see Builder.java)

Parameter	Value	Usage
otsPerPatient	0.1	Occupational therapists per total hospital capacity (see Builder.java)

Transmission Parameters (updated in 'next')

Parameters governing MRSA transmission dynamics during HCW–patient visits.

Parameter	Value	Usage
transmission_probability_hcw_to_patient*	0.4	Probability that a contaminated HCW transmits MRSA to a susceptible patient during a visit (after pre-visit hand hygiene check).
transmission_probability_patient_to_hcw*	0.1	Probability that an HCW acquires contamination from a colonized/infected patient during a visit.

Hand Hygiene, PPE, and Efficacy

Parameter	Value	Usage
hhAdherenceBase*	0.5	Base hand hygiene adherence rate (placeholder)
nurseHhAdherence*	0.5	Nurse hand hygiene adherence before patient contact (applied during HCW setup; see Builder.java)

Parameter	Value	Usage
doctorHhAdherence*	0.5	Doctor hand hygiene adherence before patient contact (applied during HCW setup; see Builder.java)
therapistHhAdherence*	0.5	Therapist hand hygiene adherence before patient contact (applied during HCW setup; see Builder.java)
nurseHhAdherencePost*	0.5	Nurse hand hygiene adherence after patient contact (applied during HCW setup; see Builder.java)
doctorHhAdherencePost*	0.5	Doctor hand hygiene adherence after patient contact (applied during HCW setup; see Builder.java)
therapistHhAdherencePost*	0.5	Therapist hand hygiene adherence after patient contact (applied during HCW setup; see Builder.java)
ppeAdherenceIfCp*	0.65	PPE (glove) adherence when visiting contact precaution patients (see Builder.java and HealthCareWorker.java)
hand_hygiene_efficacy*	0.95	Efficacy of hand hygiene when performed (used to reduce transmission risk pre-visit).
glove_efficacy*	0.5	Efficacy of gloves when worn (used to reduce post-visit contamination persistence).

Parameter	Value	Usage
hhEfficacy*	0.95	Legacy/alternate parameter for hand hygiene efficacy referenced during setup.

Reproducibility

Parameter	Value	Usage
randomSeed*	(unset)	Default random seed; if not set, simulation uses runtime default.

Disease Importation and Mortality

Parameter	Value	Usage
admitImportationInfectionProbability	0.01	Probability that newly admitted ward patient is colonized with MRSA
admitImportationInfectionProbabilityICU	0.01	Probability that newly admitted ICU patient is colonized with MRSA (inherits from ward value)
importerDieProbability	0.1	Mortality probability for colonized ward patients
importerDiePrombabilityicu	0.1	Mortality probability for colonized ICU patients (inherits from ward value, note typo in variable name)

Parameter Status Summary

- **Parameters with specific values**: ADT parameters (admission rates, LOS distributions, transfer probabilities), HCW visit timing, staffing ratios for ICU and ward doctors/nurses

- **Parameters using placeholder values**: Therapy needs probabilities, transmission probabilities, hand hygiene/PPE adherence rates, disease importation/mortality rates, ward therapist staffing ratios
- **Note**: Any parameter set to `defaultDouble` (0.1) or `defaultInt` (1) or round placeholder values (0.5, 1.0) should be considered as using placeholder values that may need adjustment based on data or literature