Epidemiology and Infection

**Application of dynamic modeling techniques to the problem of antibacterial use and resistance: a scoping review**

D. E. Ramsay, J. Invik, S. L. Checkley, S. P. Gow, N. D. Osgood, C. L. Waldner

**SUPPLEMENTARY MATERIAL: ARTICLE SEARCH STRATEGY**

**PubMed search strategy: MeSH terms where available, plus Title/Abstract keyword search**

(((((((((((((((((((((("animals, domestic"[MeSH Terms] OR "domestic animal$"[Title/Abstract] OR "food animal$”[Title/Abstract])) OR ("agriculture"[MeSH Terms] OR "agriculture"[Title/Abstract] OR "farm$"[Title/Abstract])) OR ("food chain"[MeSH Terms] OR "food chain$"[Title/Abstract])) OR ("swine"[MeSH Terms] OR "swine"[Title/Abstract] OR "pig$"[Title/Abstract] OR “piglet$”[Title/Abstract] OR "pork"[Title/Abstract])) OR ("cattle"[MeSH Terms] OR "cattle"[Title/Abstract] OR "cow$"[Title/Abstract] OR "beef"[Title/Abstract] OR “calf”[Title/Abstract] OR “calves”[Title/Abstract] OR “livestock”[Title/Abstract])) OR ("poultry"[MeSH Terms] OR "poultry"[Title/Abstract] OR chick$[Title/Abstract] OR poult$[Title/Abstract] OR broiler$[Title/Abstract] OR "chickens"[MeSH Terms] OR "chicken$"[Title/Abstract] OR "avian"[Title/Abstract] OR "turkey"[MeSH Terms] OR "turkey$"[Title/Abstract])) OR ("humans"[MeSH Terms] OR "human$"[Title/Abstract] OR "persons"[MeSH Terms] OR "person$"[Title/Abstract] OR "people"[Title/Abstract] OR "adult"[MeSH Terms] OR "adult$"[Title/Abstract] OR "child"[MeSH Terms] OR "child"[Title/Abstract] OR "children"[Title/Abstract] OR "patients"[MeSH Terms] OR "patient$"[Title/Abstract] OR kid$[Title/Abstract]))) OR (runoff[Title/Abstract] OR effluent[Title/Abstract] OR "groundwater"[MeSH Terms] OR "groundwater"[Title/Abstract] OR "manure"[MeSH Terms] OR "manure"[Title/Abstract] OR "sewage"[MeSH Terms] OR "sewage"[Title/Abstract] OR "sludge"[Title/Abstract] OR slurry[Title/Abstract] OR "fertilizers"[MeSH Terms] OR "fertilizer$"[Title/Abstract] OR "soil"[MeSH Terms] OR "soil$"[Title/Abstract] OR "compost"[Title/Abstract] OR "waste water"[MeSH Terms] OR "waste water"[Title/Abstract] OR "wastewater"[Title/Abstract]))) OR "Industrial Waste"[MeSH Terms]) OR "surface water"[Title/Abstract]) OR "industrial waste"[Title/Abstract])) OR “environment”[Title/Abstract] OR “hospital-acquired”[Title/Abstract] OR “community-acquired”[Title/Abstract] OR “nosocomial”[Title/Abstract])))) OR "community-acquired infections"[MeSH Terms]) OR "cross infection"[MeSH Terms]) OR "livestock"[MeSH Terms])

AND

((((((((((((((("simulation$"[Title/Abstract] or “simulation model$”[Title/Abstract])) OR “dynamic model$”[Title/Abstract]) OR "theoretical model$"[Title/Abstract]) OR “mathematical model$”[Title/Abstract]) OR “causal model$”[Title/Abstract]) OR “mechanistic model$”[Title/Abstract]) OR “stochastic model$”[Title/Abstract]) OR “aggregate model$”[Title/Abstract]) OR “agent-based model$”[Title/Abstract]) OR (“system dynamic model$”[Title/Abstract] OR “system dynamics model$”[Title/Abstract] OR “systems dynamics model$”[Title/Abstract] OR “systems science” OR “differential equation$”)))))) OR (("monte carlo method"[MeSH Terms]) OR "monte carlo"[Title/Abstract])

AND

((((((((((("antimicrobial use"[Title/Abstract]) OR "antimicrobial resistance"[Title/Abstract]) OR "antimicrobial susceptibility"[Title/Abstract]) OR "antimicrobial stewardship"[Title/Abstract]) OR "antibiotic use"[Title/Abstract]) OR ("drug resistance, microbial"[MeSH Terms] OR "microbial drug resistance"[Title/Abstract] OR "antibiotic resistance"[Title/Abstract])) OR "antibiotic susceptibility"[Title/Abstract]) OR “AMU”[Title/Abstract]) OR “AMR”[Title/Abstract]) OR ("drug resistance, bacterial"[MeSH Terms] OR "bacterial drug resistance"[Title/Abstract]))))

**Scopus search strategy: Title/Abstract/Keyword search**

TITLE-ABS-KEY ( simulation  OR  "simulation model"  OR  "dynamic model"  OR  "causal model"  OR “theoretical model” OR “mathematical model” OR "mechanistic model"  OR  "stochastic model"  OR  "aggregate model"  OR  "agent-based model"  OR  "system dynamic model"  OR  "system dynamics model"  OR  "systems dynamics model"  OR  "systems science"  OR  "monte carlo"  OR  "differential equation" )

AND

TITLE-ABS-KEY ( "antimicrobial use"  OR  "antimicrobial resistance"  OR  "antimicrobial susceptibility"  OR  "antimicrobial stewardship"  OR  "antibiotic use"  OR  "microbial drug resistance"  OR  "antibiotic resistance"  OR  "antibiotic susceptibility"  OR  "bacterial drug resistance"  OR  amu  OR  amr )

AND

TITLE-ABS-KEY ( "domestic animals"  OR  "domestic animal"  OR  "food animal"  OR  "food animals"  OR  agriculture  OR  farm  OR  "food chain"  OR  livestock  OR  swine  OR  pig  OR  piglet  OR  pork  OR  cattle  OR  cow  OR  beef  OR  dairy  OR  calf  OR  calves  OR  poultry  OR  chick  OR  poult  OR  broiler  OR  chicken  OR  avian  OR  turkey  OR  human  OR  person  OR  people  OR  adult  OR  child  OR  children  OR  patient  OR  kid  OR  runoff  OR  effluent  OR  "industrial waste"  OR  groundwater  OR  manure  OR  sewage  OR  sludge  OR  slurry  OR  fertilizer  OR  soil  OR  compost  OR  "waste water"  OR  wastewater  OR  "surface water"  OR  environment  OR  "community-acquired"  OR  "hospital-acquired"  OR  nosocomial )

**Agricola search strategy: Title/Abstract/Keyword search (ProQuest Search)**

(ti("antimicrobial use" OR "antimicrobial resistance" OR "antimicrobial susceptibility" OR "antimicrobial stewardship" OR "antibiotic use" OR "microbial drug resistance" OR "antibiotic resistance" OR "antibiotic susceptibility" OR "bacterial drug resistance" OR amu OR amr) OR ab("antimicrobial use" OR "antimicrobial resistance" OR "antimicrobial susceptibility" OR "antimicrobial stewardship" OR "antibiotic use" OR "microbial drug resistance" OR "antibiotic resistance" OR "antibiotic susceptibility" OR "bacterial drug resistance" OR amu OR amr))

AND

(ab("domestic animals" OR "domestic animal" OR "food animal" OR "food animals" OR agriculture OR farm OR livestock OR "food chain" OR swine OR pig OR piglet OR pork OR cattle OR cow OR beef OR dairy OR calf OR calves OR poultry OR chick OR poult OR broiler OR chicken OR avian OR turkey OR human OR person OR people OR adult OR child OR children OR patient OR kid OR runoff OR effluent OR "industrial waste" OR groundwater OR manure OR sewage OR sludge OR slurry OR fertilizer OR soil OR compost OR "waste water" OR wastewater OR "surface water" OR environment OR "community-acquired" OR "hospital-acquired" OR nosocomial) OR ti("domestic animals" OR "domestic animal" OR "food animal" OR "food animals" OR agriculture OR farm OR livestock OR "food chain" OR swine OR pig OR piglet OR pork OR cattle OR cow OR beef OR dairy OR calf OR calves OR poultry OR chick OR poult OR broiler OR chicken OR avian OR turkey OR human OR person OR people OR adult OR child OR children OR patient OR kid OR runoff OR effluent OR "industrial waste" OR groundwater OR manure OR sewage OR sludge OR slurry OR fertilizer OR soil OR compost OR "waste water" OR wastewater OR "surface water" OR environment OR "community-acquired" OR "hospital-acquired" OR nosocomial))

AND

(ti(simulation OR "simulation model" OR "dynamic model" OR "causal model" OR "mechanistic model" OR "stochastic model" OR "theoretical model" OR “mathematical model” OR "aggregate model" OR "agent-based model" OR "system dynamic model" OR "system dynamics model" OR "systems dynamics model" OR "systems science" OR "differential equation" OR "monte carlo") OR ab(simulation OR "simulation model" OR "dynamic model" OR "causal model" OR "mechanistic model" OR "stochastic model" OR "theoretical model" OR "aggregate model" OR "agent-based model" OR "system dynamic model" OR "system dynamics model" OR "systems dynamics model" OR "systems science" OR "differential equation" OR "monte carlo"))

**CAB Abstracts search strategy: Title/Topic Search (Web Of Science Search)**

ti=(simulation OR "simulation model" OR "dynamic model" OR "causal model" OR "mechanistic model" OR “mathematical model” OR "stochastic model" OR "theoretical model" OR "aggregate model" OR "agent-based model" OR "system dynamic model" OR "system dynamics model" OR "systems dynamics model" OR "systems science" OR "differential equation" OR "monte carlo") OR ts=(simulation OR "simulation model" OR "dynamic model" OR "causal model" OR "mechanistic model" OR "stochastic model" OR "theoretical model" OR "aggregate model" OR "agent-based model" OR "system dynamic model" OR "system dynamics model" OR "systems dynamics model" OR "systems science" OR "differential equation" OR "monte carlo")

AND

ti=("antimicrobial use" OR "antimicrobial resistance" OR "antimicrobial susceptibility" OR "antimicrobial stewardship" OR "antibiotic use" OR "microbial drug resistance" OR "antibiotic resistance" OR "antibiotic susceptibility" OR "bacterial drug resistance" OR amu OR amr) OR ts=("antimicrobial use" OR "antimicrobial resistance" OR "antimicrobial susceptibility" OR "antimicrobial stewardship" OR "antibiotic use" OR "microbial drug resistance" OR "antibiotic resistance" OR "antibiotic susceptibility" OR "bacterial drug resistance" OR amu OR amr)

AND

ti=("domestic animals" OR "domestic animal" OR "food animal" OR "food animals" OR agriculture OR farm OR livestock OR "food chain" OR swine OR pig OR piglet OR pork OR cattle OR cow OR beef OR dairy OR calf OR calves OR poultry OR chick OR poult OR broiler OR chicken OR avian OR turkey OR human OR person OR people OR adult OR child OR children OR patient OR kid OR runoff OR effluent OR "industrial waste" OR groundwater OR manure OR sewage OR sludge OR slurry OR fertilizer OR soil OR compost OR "waste water" OR wastewater OR "surface water” OR environment OR “community-acquired” OR “hospital-acquired” OR nosocomial) OR ts=("domestic animals" OR "domestic animal" OR "food animal" OR "food animals" OR agriculture OR farm OR livestock OR "food chain" OR swine OR pig OR piglet OR pork OR cattle OR cow OR beef OR dairy OR calf OR calves OR poultry OR chick OR poult OR broiler OR chicken OR avian OR turkey OR human OR person OR people OR adult OR child OR children OR patient OR kid OR runoff OR effluent OR "industrial waste" OR groundwater OR manure OR sewage OR sludge OR slurry OR fertilizer OR soil OR compost OR "waste water" OR wastewater OR "surface water” OR environment OR “community-acquired” OR “hospital-acquired” OR nosocomial)