

Isolation and Household

1 Introduction

1.1 Indemics Framework

Indemics (Interactive Epidemic Simulation) is an interactive, high performance modeling framework for real time pandemic planning, situation assessment and course of action analysis.

1.2 Intervention

An intervention modifies the states or the social neighbor connections of some individuals. An intervention consists of a trigger and an action. The action is applied when the trigger condition is satisfied for the first time.

Indemics separates the simulations of intervention policy and epidemic diffusion. The client can describe his intervention scenario in Indemics client commands and submit them to Indemics to simulate the intervention effect in epidemic management. This manual explains how to develop interventions in Indemics and how to use indemics to perform specific intervention case studies.

1.3 Expressing interventions using SQL

A given intervention scenario is specified using SQL and typically consists of a set of queries. These queries are executed one after another each day, to find the subpopulation to be intervened.

2 Sweep

- parameter: to sweep
- (Float) start_val: value starting the sweep
- (Float) inc: value incrementing the value of the sweep
- (Float) end_val: value ending the sweep

e.g. Compliance values (0.5, 1.0):

```
< start_val > 0.5 < /start_val >  
< inc > 0.5 < /inc >  
< end_val > 1.0 < /end_val >
```

e.g. Replicate values (0, 1):

```
< start_val > 0 < /start_val >
```

`< inc > 1 < /inc >`
`< end_val > 1 < /end_val >`

3 Running the Intervention

To run the intervention:

https://ndsslgit.vbi.vt.edu/ndssl-software/dicex_epistudy/blob/master/tlc_manual.pdf

4 Project Repository

https://ndsslgit.vbi.vt.edu/ndssl-software/dicex_epistudy

5 Ring Intervention

The trigger is the number of days before an infectious individual gets diagnosed, it will activate an intervention to every contact in his household. The intervention will be administrated to the household contacts if there's availability.

5.1 SQL template

- update the intv_daily table with workers with x days of symptoms that need to be intervened
update intv_daily set intervened="now", acttype=2 from (select pid from sick_individual where time = 'expr "now" - i0_daysill')as O where intervened=-1 and intv_daily.pid=O.pid
- update the intv_daily table with household members from the individuals that need to be intervened
update intv_daily set intervened="now" from (select pid from person_info where hid in (select hid from person_info where pid in (select pid from intv_daily where intervened="now" and acttype=2)))as O where intervened=-1 and intv_daily.pid=O.pid
- insert into intv table household members that need to be intervened if vaccines are available
insert into intv select * from intv_daily where intervened="now" and acttype=0 and intervened>=i0_atday order by random() limit (i0_vaccines - (select count (*) from intv))
- set interventions
0,i0_type,i0_compliance,i0_duration,i0_delay,i0_efficacy_in,i0_efficacy_out, select pid from intv where intervened = "now"

5.2 Parameters to run the Ring intervention with example values for the plots presented in Figure 1

- iql_key: i0
- (Integer) type: 0
- (Float) compliance: 1.0

- (Int) duration: 20
- (Int) delay: 0
- (Float) efficacy-in: 0.2
- (Float) efficacy-out: 0.2
- (Float) ascertain: 0.6
- (Int) days ill: 1
- (Int) vaccines: 100000
- (Int) atday: varying values {20,30,40,50}

5.3 Ring Intervention Plots

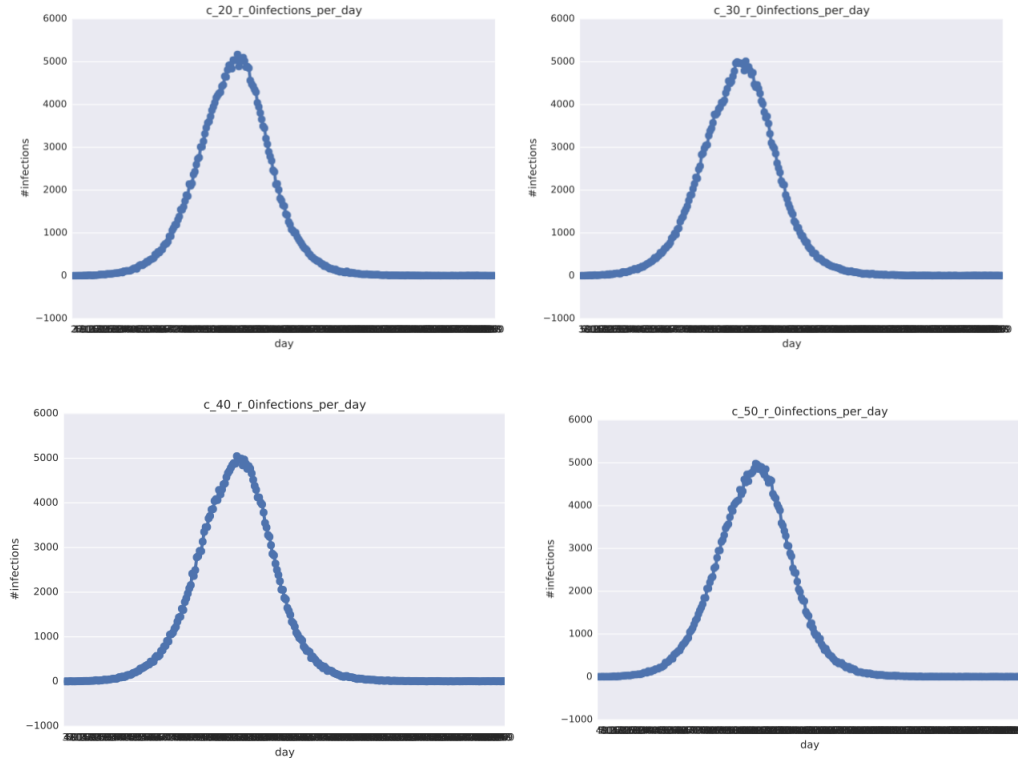


Figure 1: Ring Intervention

6 Household Intervention

intervention0: All symptomatic individuals retire home from the workplace after x days of being ill.

intervention1: Household contacts receive y days of treatment.

intervention2: All symptomatic individuals receive z days of treatment.

6.1 SQL template

- update the intv table with workers with x days of symptoms that need to be intervened
update intv set intervened="now", acttype=2 from (select pid from sick_workers where time = 'expr "now" -i0.daysill')as O where intervened=-1 and intv.pid=O.pid"
- update the intv table with household members from the workers that need to be intervened
update intv set intervened="now" from (select pid from person_info where hid in (select hid from person_info where pid in (select pid from intv where intervened="now" and acttype=2)))as O where intervened=-1 and intv.pid=O.pid"
- set interventions
 - (1) 0,i0_type,i0_compliance,i0_duration,i0_delay,i0_efficacy_in,i0_efficacy_out, select pid from replicate_desc_intv where intervened = "now" and acttype=2;
 - (2) 1,i1_type,i1_compliance,i1_duration,i1_delay,i1_efficacy_in,i1_efficacy_out, select pid from replicate_desc_intv where intervened = "now" and acttype=0;
 - (3) 2,i2_type,i2_compliance,i2_duration,i2_delay,i2_efficacy_in,i2_efficacy_out, select pid from replicate_desc_intv where intervened = "now" and acttype=2;

6.2 Parameters to run the Household intervention with example values for the plots presented in Figure 2

Intervention1

- iql_key: i0
- (Integer) type: 3
- (Float) compliance: 1.0
- (Int) duration: 300
- (Int) delay: 0
- (Float) efficacy-in: 1.0
- (Float) efficacy-out: 1.0
- (Float) ascertain: 0.6
- (Int) days ill: varying values {1,2,3,4}

Intervention 2

- iql_key: i1
- (Integer) type: 1

- (Float) compliance: 1.0
- (Int) duration: 300
- (Int) delay: 20
- (Float) efficacy-in: 0.2
- (Float) efficacy-out: 0.2

Intervention 3

- iql_key: i2
- (Integer) type: 7
- (Float) compliance: 1.0
- (Int) duration: 300
- (Int) delay: 0
- (Float) efficacy-in: 1.0
- (Float) efficacy-out: 1.0

6.3 Household Intervention Plots

7 Block Intervention

Vaccinate all people in any block if the fraction of diagnosed people in that block exceeds some threshold.

7.1 SQL template

- update table with blocks and the number of people infected for more than x days
insert into block_win_diag_count select bid, sum(infections), "now" from block_daily_diag_count where day between 'expr "now" - i0_daysill' and "now" group by bid
- updates the block_intervened table to specify which blocks gets intervened in a certain day
update block_intervened set intervened = "now" from (select s.bid from block_win_diag_count s, block_intervened i where day = "now" and (s.infections::float/i.persons > i0_threshold) and s.bid=i.bid) AS O where intervened = -1 and block_intervened.bid=O.bid
- set interventions
0,i0_type,i0_compliance,i0_duration,i0_delay,i0_efficacy_in,i0_efficacy_out, select pid from block_info b, block_intervened i where b.block=i.bid and i.intervened = "now"

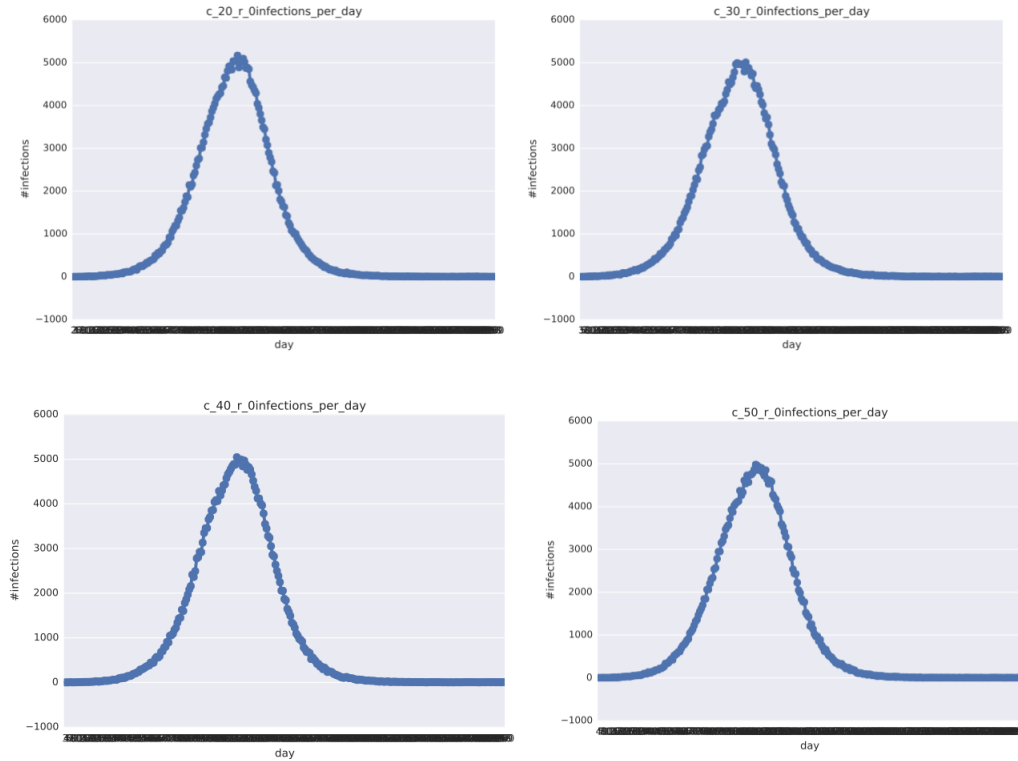


Figure 2: Household Intervention

7.2 Parameters to run the Block intervention

- iql_key: i0
- (Integer) type: 0
- (Float) compliance: 1.0
- (Int) duration: 300
- (Int) delay: 20
- (Float) efficacy-in: 0.1
- (Float) efficacy-out: 0.1
- (Int) days ill: 1
- (Int) threshold: 0.06
- (Int) atday: varying values {0.04, 0.05, 0.06}