Implementation Plan for Chapter 3:

Chlamydia, Acquired Immunity, and Expedited Partner Therapy

Aim: To develop a comprehensive modeling framework and set of parameters specific to expedited partner therapy to understand the individual- and population-level outcomes between this innovative strategy and the standard practices in chlamydia control, and to understand the consequences of treatment timing on the development of immunity and possible reinfection.

*Hypotheses:*

3a: By leveraging the transmission network in reverse, increases in EPT will not only reduce chlamydia transmission and reinfection more efficiently than increases in testing rates, but it will also more effectively reduce the racial disparities in prevalence.

3b: While EPT may initially increase the number of people with arrested immunity and lower herd immunity, the increases in the absolute number and pace of partner treatment balance out any increased susceptibility while current screening and treatment methods act to increase the vulnerability of populations.

Population: 15-44 year olds, but focus of analyses is 15-29 year olds

Important Features of model:

1. acquired immunity (see 2020 paper!)

2. racial groups – most CT models haven’t incorporated race b/c they are in London / Netherlands or more interested in the age dynamics

3. Increase acquisition risk of CT for adolescent women due to immature cervix cells? / decreased acquisition risk post-exposure

Questions to Address:

1. EPT and prevalence reduction efficiency
   1. Description: evaluate how quickly EPT can reduce incidence in subpopulations – idea here being that we can reduce incidence overall AND racial / age disparities since the intervention should be more effective in higher-prevalence scenarios
   2. Evaluation Metrics
      1. Incidence reduction over time
         1. By increasing EPT coverage (proportion of partners treated)
         2. By increasing EPT timing (decreasing time-to-treatment for partners)
         3. Compare to: increasing testing in certain groups or increasing testing among partners of chlamydia positive patients
      2. Rate of reduction among age and race groups over time
   3. Other Metrics
      1. How many people were treated but not infected over time and by EPT coverage
      2. Total number tested
      3. Total number treated
2. Treatment/EPT and Acquired Immunity
   1. Description: treatment of asymptomatic infections arrests the formation of temporary immunity to reinfection (problem for individual and future transmissions due to reinfection)
   2. Evaluation Metrics
      1. Proportion reinfected within X time post-treatment as treatment increases
      2. Avg number of forward transmissions per reinfection vs per asymptomatic case (post-avg time to treatment if asymptomatic?)
      3. Number of likely PID / infertility cases arising from long-term asymptomatic infections

Concerns of EPT: missed opportunity to test for GC and/or other STIs

What this model is NOT addressing:

1. Co-infection / transmission of gonorrhea or other STIs
2. Rectal chlamydia / Oral chlamydia

On relational prevalence by risk group – I think separating networks into relationship type already does this to an extent – i.e. those who form a cohab/marriage are less likely to have many casual relationships

*MM/SMG feedback 12.3.2020:*

*Don’t actually model race*

*Model different prevalence scenarios*

12.8.2020

New strategy: three different setups that typify behavior over life course

Can alter initial prevalence in each scenario to mimic existing racial disparities

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | “15-24” Profile | “25-34” | “35-44” |
| Casual |  |  |  |  |
|  | Degree |  |  |  |
|  | Concurrency |  |  |  |
|  | Sex per week |  |  |  |
|  | Condom use |  |  |  |
| Mar/Coh |  |  |  |  |
|  | Degree |  |  |  |
|  | Sex per week |  |  |  |
|  | Condom use |  |  |  |
| Screening in Females |  |  |  |  |

12.10.20

Thinking this through a bit more. I think modeling age groups separately will be unnecessarily complex given age boundary issues if we’re dividing the population up even more than below 15 and above 44

So just build a 15-44 model that represents the national rates, and model different prevalence scenarios that could mimic racial or geographic differences

For model-based sexual behavior parameter approach – need partnership-level data

So for condom use, the “condom use at last sex with this partner” instead of the prop sex acts with condom use ego-level calculated measure

But for sex acts – that’s a summary measure per week

Although so little concurrency we could treat this as a dyad-level attribute – but how to handle

For age, Sam (at least in the PreP-Optim code) uses “age combination” which is just age1 + age2

One setup, then vary screening/access to care and concurrency to change

Whole thing might not work if women get screened but men are having concurrent partners than nothing may work! 2nd order network effects

Terms in models (for sex acts count / condom use as outcomes)

* Partnership type (main/casual)
* Current duration
* Age combo

absdiff(~age + shift\*(sex=="F"))

or

age for men

age for women + shift

and use those attrs for absdiff

if that doesn’t get the activity by sex/age right, maybe try something similar with the nodecov:

nodecov(~age – shift\*(sex==”M”))

and agesquared

1/27/2021 re-capping goals of chapter

1. **EPT and prevalence reduction efficiency among heterosexuals & concurrency**
2. Description: evaluate how quickly EPT can reduce incidence in subpopulations – idea here being that we can reduce incidence overall AND disparities since the intervention should be more effective in higher-prevalence/different behavior scenarios
3. Differences in age/race groups modeled by separate scenarios with varying levels of concurrency & initial prevalence
4. Big question here – does male concurrency limit the efficiency of EPT?
   1. Women get screened more often to pick up asymptomatic infections
   2. They can notify their partners
   3. What about 2nd degree notification – do their male partners then tell their partners? If they have more concurrent partners aka more partners at risk but they aren’t the primary case, does that limit the treatment in meaningful ways?
5. Evaluation Metrics
   1. prevalence reduction over time
      1. By increasing EPT coverage (proportion of partners treated)
      2. By increasing EPT timing (decreasing time-to-treatment for partners)
      3. Compare to: baseline and scenarios w/ increasing screening rates
   2. Rate of reduction between scenarios
   3. How many people were treated but not infected over time and by EPT coverage
   4. Total number tested
   5. Total number treated
6. **Treatment/EPT and Acquired Immunity**
   1. Description: treatment of asymptomatic infections arrests the formation of temporary immunity to reinfection (problem for individual and future transmissions due to reinfection)
   2. Big question – do we increase reinfection through treatment, can EPT reduce this meaningfully
   3. Evaluation Metrics
      1. Proportion reinfected within X time post-treatment as treatment increases
      2. Avg number of forward transmissions per reinfection vs per asymptomatic case (post-avg time to treatment if asymptomatic?)
      3. Number of likely PID / infertility cases arising from long-term asymptomatic infections
         1. PID can happen due to 1 long term infection
         2. Also multiple reinfections

What this model is NOT addressing:

1. Co-infection / transmission of gonorrhea or other STIs
2. Concerns about antibiotic resistance & gonorrhea/syphilis
3. Rectal chlamydia / Oral chlamydia