PARAMETERS IV:
CLINICAL CARE AND TREATMENT

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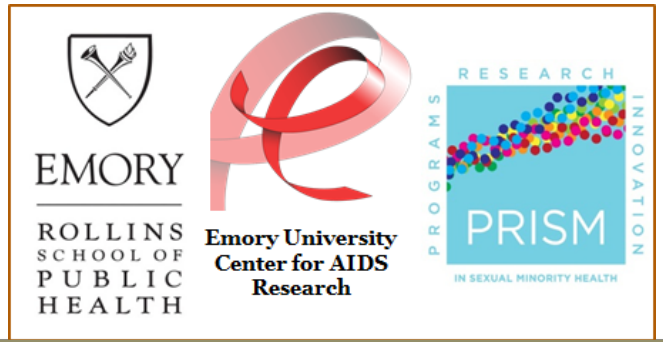

Outline for this session

- Care continuum as modeled
  - HIV testing
  - ART initiation (linkage to care with ART)
  - Dynamic engagement in care via ART on/off status
  - Dynamic suppression status
    - On ART, fully suppressed
    - On ART, partially suppressed
    - (Not suppressed because not on ART or undiagnosed)

HIV testing

HIV testing: concept

- HIV testing is critical prevention tool
  - Behavior changes post-diagnosis
  - Necessary for receipt of HIV care (and PrEP in PrEP models)
- Model conceptualized 2 types of testers
  - Never testers – 6.5% of sample didn't have HIV test by age 40
  - Regular testers: memoryless exponential process, per mean time between tests
  - Susie Cassells (UCSB) has R21 extending to more types
- Also incorporated 21-day window period until Ab detection
  - HIV+ positive persons thus test HIV-ne

HIV testing: assessment

62. Have you ever been tested for HIV?

1 ◯ Yes
0 ◯ No

If yes, then #63, #64, #65, #66

HIVtest_ever

Binary_prefernot.

63. In what month and year did you have your most recent HIV test?

Month:

January	=1
February	=2
March	=3
April	=4
May	=5
June	=6
July	=7
August	=8
September	=9
October	=10
November	=11
December	=12

HIVtest_month

HIVtest_month.

64. Year: HIVtest_year

65. What was the result of your most recent HIV test?

HIVtest_result

HIVtest_result.

0 ◯ Negative
1 ◯ Positive
2 ◯ Indeterminant/Inconclusive
3 ◯ Didn't get the results of my last HIV test

If positive, then hide #67, #70, #71, #72, #73. If positive, then show #68, #69

HIV testing: model metric

- Mean time since last test: (today – date of last test)
  - BMSM: 301 days
  - WMSM: 315 days

- Assuming testing is memoryless exponential with rate parameter equal to above means, Bernoulli daily (-> weekly) testing probability is the inverse of these.

ART initiation
(linkage to care with ART)

ART linkage/initiation

- Linkage to care defined in many ways, but typically about the duration from diagnosis until first HIV clinical visit

- The model has no direct representation of clinical visits
  - It does have ART, which is a primary purpose of HIV care
  - Linkage to care to data empirically available in some CDC reports
  - But not time to ART initiation. Assumed instant initiation of therapy once in care

- Following HIV diagnosis, MSM initiated treatment:
  - BMSM rate = 0·924/week (10.8 weeks on avg.)
  - WMSM rate = 1.271/week (7.9 weeks on avg.)

Dynamic engagement in care

Dynamic engagement in care: model concept

- Persons on ART can fall out of care
  - Viral load returns to 4.5 $\log_{10}$ set-point linearly over 3 months
- Persons can re-engage in care and resume adherence process
- Rates based on cross-sectional CDC care continuum sources
  - Volumes can be said about the veracity of these estimates

Dynamic suppression status|on ART

- Once on ART, may or not be fully adherent
  - Like "care" is modeled as ART on/off status, adherence is modeled in terms of VL suppression levels
    - Fully suppressed = 1.5 $\log_{10}$ = 50 copies/mL = LLD
    - Partially suppressed = (Not suppressed can occur if on ART or undiagnosed)
    - (unsuppressed occurs if not diagnosed or not on ART)
  - Can cycle between full/partial states
  - Rate parameter back-calculation complicated and used CDC paper on:
    - Viral suppression at last test
    - "Durable" viral suppression at all test for 12 months

Dynamic suppression status|on ART

Parameter	Black MSM	White MSM
Proportion of those initiating ART who achieved full suppression	0·614	0·651
Per-time step probability of falling out of suppression	0·0102	0·0071
Per-time step probability of re-achieving suppression	0·00066	0·00291

Implementing in the model

Testing

- param.mard:

```
nction (nwstats, last.neg.test.B.int = 301, mean.test.B.int = 301,
  last.neg.test.W.int = 315, mean.test.W.int = 315, testing.pattern = "interval",
  test.window.int = 21, tt.traj.B.prob = c(0.077, 0, 0.356,
```

- test.mard:

```
  if (testing.pattern == "interval") {
      tsincelntst <- at - dat$attr$last.neg.test
      tsincelntst[is.na(tsincelntst)] <- at - dat$attr$arrival.time[is.na(tsincelntst)]
      tst.B <- which(active == 1 & race == "B" & tt.traj !=
          "NN" & (diag.status == 0 | is.na(diag.status)) &
          tsincelntst >= mean.test.B.int)
      tst.W <- which(active == 1 & race == "W" & tt.traj !=
          "NN" & (diag.status == 0 | is.na(diag.status)) &
          tsincelntst >= mean.test.W.int)
  }
  tst.pos.B <- tst.B[status[tst.B] == 1 & inf.time[tst.B] <=
      at - twind.int]
  tst.neg.B <- setdiff(tst.B, tst.pos.B)
  tst.pos.W <- tst.W[status[tst.W] == 1 & inf.time[tst.W] <=
```

Treatment initiation, halting, re-initiation

- param.mard:

```
test.window.int = 21, tt.traj.B.prob = c(0.077, 0, 0.356,
    0.567), tt.traj.W.prob = c(0.052, 0, 0.331, 0.617), tx.init.B.prob = 0.092,
tx.init.W.prob = 0.127, tx.halt.B.prob = 0.0102, tx.halt.W.prob = 0.0071,
tx.reinit.B.prob = 0.00066, tx.reinit.W.prob = 0.00291,
```

- tx.mard: who initiates, halts, and re-starts treatment, e.g.:

```
tx.init.elig.B <- which(active == 1 & race == "B" & status ==
    1 & tx.status == 0 & diag.status == 1 & tt.traj %in%
    c("YP", "YF") & cum.time.on.tx == 0 & stage != "D")
tx.init.B <- tx.init.elig.B[rbinom(length(tx.init.elig.B),
    1, tx.init.B.prob) == 1]
tx.init.elig.W <- which(active == 1 & race == "W" & status ==
```