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Agenda

Objective

- The objective of the WHAMP project is to evaluate the ADAP and the PrEP-DAP programs with respect to the cost and effectiveness (e.g., # of HIV infections averated) in the state of Washington.
- Demographics such as individuals' income and insurance type are important to accurately calculate the costs because these factors
  - Determine the eligibility of the applicants.
  - Affect how much the drug assistant program might pay for each enrollee.
- Modified the `EpiModelHIV` package (branch `prep-race`) to incoporate the need of cost evaluation for the two programs.
- The primary features added to `EpiModelHIV` platform:
  - Costs.
  - Insurance/income characteristics, enrollment in DAP.
  - Dependency of other EpiModel processes on these characteristics.

Drug assistance programs

- HIV drug assistance program (ADAP):
  - Provides services to help the HIV-positive people obtain healthcare.
  - Services include:
    - Pay for HIV-related prescription medications.
    - Provides assistance in acquiring insurance.
    - Provides assistance with insurance premium payments and co-pays on HIV-related medications and office services.
  - Eligibility depends on the income and insurance of the individuals.
- PrEP drug assistance program (PrEP-DAP):
  - Provides medications and healthcare to HIV-negative people who are at risk.
  - Services pay for certain PrEP and relevant medication costs such as lab and medical visits.
  - Eligibility depends on the income and insurance of the individuals but have different cutoff than ADAP.
- Eligibility of the two programs depends on income and insurance type of the person, but the criteria are different.
  - ADAP eligibility
  - PrEP decision tree

Data sources

Summary of modules modified and added

- To add the CEA functionality, we added the following groups of factors/features to the `EpiModelHIV` package.
  - Individual attributes
  - Income/insurance influences the original process
  - DAP enrollment
  - DAP recertification
  - DAP influences outcomes
  - Costs

Color code:

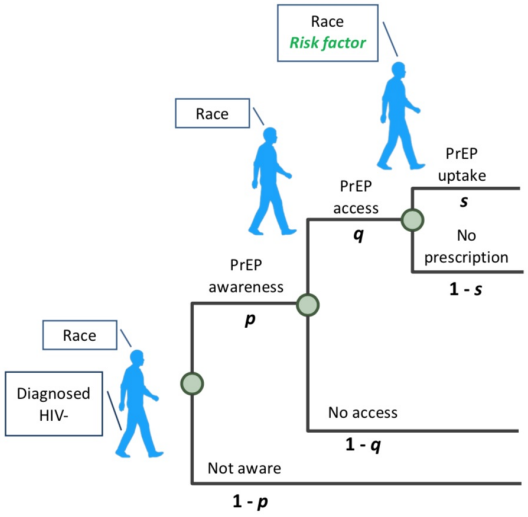
1. Module added
2. Module modified
3. Factors/features to be added

Factors/features	Modification/addition	Files changed/added
Individual attributes		
Annual income	Continuous and categorical income	param.R mod.initialize.R mod.births.R mod.insure_income.R
Insurance	5 levels: Uninsured, Self-pay bronze, Self-pay silver+, employer, government	params.R mod.initialize.R mod.births.R mod.insure_income.R
Region		
Interaction between age and the factors above		
Income/insurance influences process		
Test/trest trajectory	Test/treat trajectory interacts with insurance type	mod.initialize.R mod.births.R
PrEP awareness	Depends on both race and income	mod.prep.R
PrEP access	Depends on race, income, and insurance	mod.prep.R
DAP enrollment		
ADAP enrollment at diagnosis	Enrollemnt triggered at diagnosis. Depends on income and insurance type.	mod.adap.R
ADAP enrollment at other times	Background probability of filing application	mod.adap.R
PDAP enrollment	Depends on insurance type	mod.prep.R
DAP recertification		
ADAP recertification and discontinuation	Recertify at every 6 months. Potential for change in eligibility due to income and insurance changes.	mod.adap.R
PDAP recertification and discontinuation	Recertify every year. Depends on negative test in 90 days, race, risk factors.	mod.prep.R

DAP influences outcomes		
Test/treat trajectory	ADAP causes individuals to change from trajectory 2 to 3 or 4	mod.adap.R
ART initiation	ADAP enrollees have higher probability to start ART	mod.tx.R
ART discontinuation/ reinitiation	ADAP enrollees have lower probability to stop ART. ADAP enrollees have higher probability to reinitiate ART. There might be other factors influencing ADAP discontinuation: on treatment, income, and insurance, etc.	mod.tx.R
PrEP initiation	Depends on risk factors and PDAP attribute	mod.prep.R
Costs		
ADAP client costs	Premium ART treatment STI testing/treatment costs other healthcare costs	mod.cost.R
PDAP client costs	Gilead benefit HIV testing costs STI testing/treatment cost Other healthcare costs	mod.cost.R
ADAP assessment costs		
PDAP assessment costs		

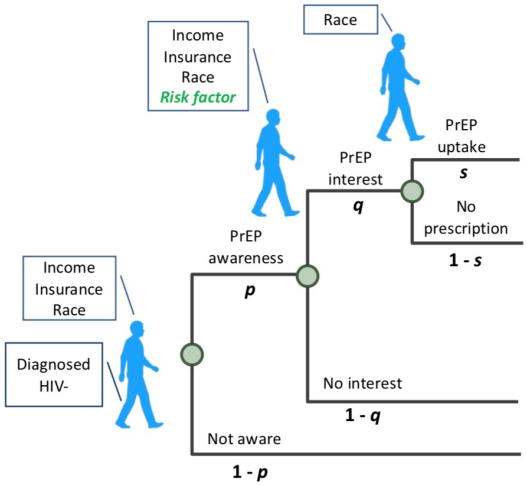
PrEP care continuum

Current care continuum

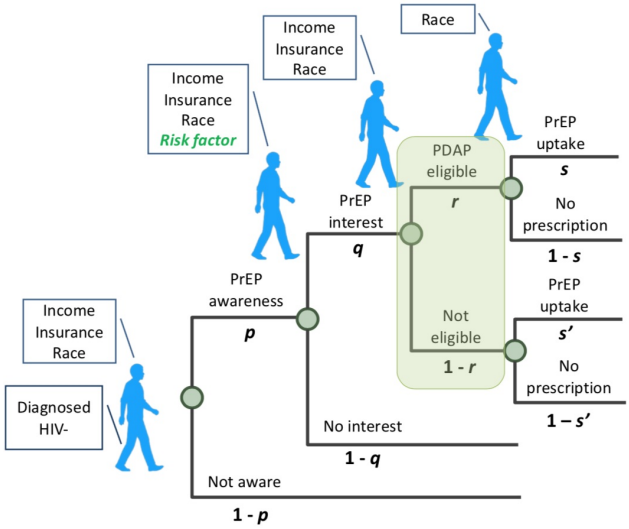


Adding PrEP-DAP

Without PrEP-DAP



With PrEP-DAP



- PrEP awareness and uptake could depend on income, insurance, and risk factors.
- The code doesn't take PrEP interest into consideration currently.
- Do people who take PrEP ~= PDAP enrollees?
- How to incorporate PrEP interest and PDAP eligibility to the current care continuum structure?

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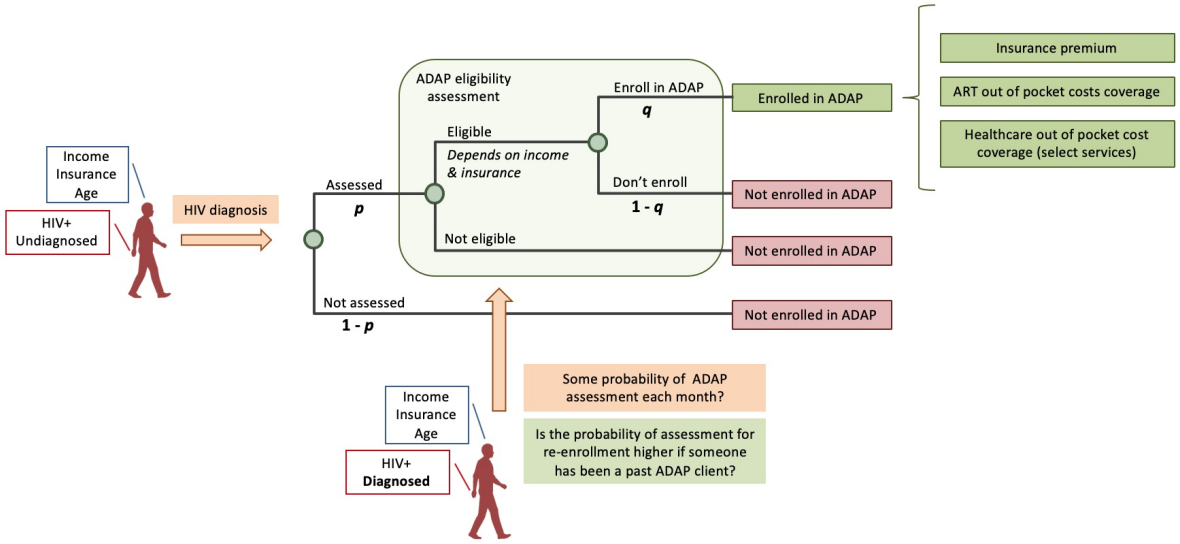
DAP enrollment



Eligibility criteria:

Program	Dignosis	Income	Insurance	Prescription	Risk factors
ADAP	Proof of HIV+	138%-400% of FPL	1. Uninsured: find insurance for them 2. Insured: exclude government provided insurance	Doesn't seem required	NA
PDAP	Tested HIV- within 14 days	>138% FPL for family of 1	Can be uninsured or insured but *cannot* receive medicaid or medicare part D	The provider would say that they prescibed TRUVADA to the patient	1. STI+ in the last 12 months. 2. Unprotected sex outside of mutually monogamous relationship. 3. HIV+ partner is on ART but not virally suppressed.

- Questions to DOH:
  - Do ADAP enrollees have to initiate ART to be eligible to ADAP?
  - Do PrEP-DAP enrollees have to initiate PrEP to be eligible to PrEP-DAP?
  - Are the risk factors considered as elibility criteria in PrEP-DAP application?

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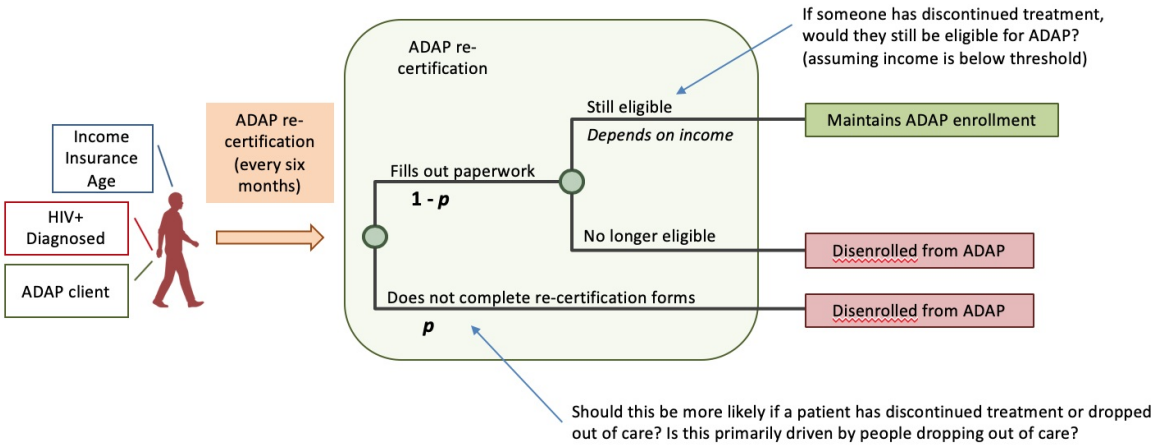
DAP recertification



Recertification criteria:

Program	Frequency of recertifications	Diagonisis
ADAP	Every 6 months	NA
PDAP	Every year	HIV- test in the last 90 days

- Questions to DOH:
  - How likely do ADAP/PrEP-DAP enrollees send recertification?
  - If an enrollee doesn't send recertification, what was the reason?

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DAP status influences outcomes

- Enrollees are assigned DAP attribute.
- ADAP:
  - ADAP active assigned trajectory 2 could change to trajectory 3 or 4.
  - ADAP active have higher probability to (re)initiate ART.
  - ADAP active have lower probability to discontinue ART.
- PrEP-DAP:
  - PrEP-DAP active are more likely to initiate PrEP.
  - Question: would PrEP-DAP active behave differently than individuals who are on PrEP but have no PrEP-DAP?
    - stoppage
    - adherence
    - STI testing
    - HIV test

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DAP costs

- ADAP costs
  - Client costs
    - insurance premium
    - ART out of pocket costs coverage
    - healthcare out of pocket cost coverage (select services)
  - Assessment cost
- PrEP-DAP costs
  - Client costs
    - Gilead benefits
    - Medical and lab visits costs
    - STI treatment costs
    - other relevante healthcare costs (selective services)
  - Assessment cost

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Use of `data.table` for input parameters

- Because of the interactions between demographics, we used `data.table` (`library(data.table)`) to manage the parameters.
- The key(s) for each `data.table` allowed us to look up corresponding values for individuals with varying attributes.
- These keys could be race, income, insurance type, etc.
- For example:

```
dist.insure.type.raw = list(B = matrix(c(0.3, 0, 0, 0, 0.7,
                                         0.2, 0.6, 0.1, 0, 0.1,
                                         0, 0.35, 0.39, 0.25, 0.01,
                                         0, 0.10, 0.40, 0.49, 0.01,
                                         0, 0.10, 0.40, 0.49, 0.01),
                                         dimnames = list(c(1:5), c("uninsured", "self bronze", "self non-bronze", "
employer", "government")),
                                         nrow = 5, byrow = T),
                            W = matrix(c(0.3, 0, 0, 0, 0.7,
                                         0.2, 0.6, 0.1, 0, 0.1,
                                         0, 0.35, 0.39, 0.25, 0.01,
                                         0, 0.10, 0.40, 0.49, 0.01,
                                         0, 0.10, 0.40, 0.49, 0.01),
                                         dimnames = list(c(1:5), c("uninsured", "self bronze", "self non-bronze", "
employer", "government")),
                                         nrow = 5, byrow = T))

dist.insure.type = data.table(race = rep(c("B", "W"), each = 5),
                              income.cate = rep(c(1:5), 2),
                              do.call(rbind, dist.insure.type.raw),
                              key = c("race", "income.cate"))
```

In this table, we set up keys for later use. If we want to seach values for a black man in income category 4. We can provide the values to the table `dist.insure.type` .

```
> ix.race = c("B")
> ix.income = c(4)
> dist.insure.type[.(ix.race, ix.income)]

   race income.cate uninsured self bronze self non-bronze employer government
1:    B           4         0         0.1             0.4     0.49       0.01
```

We can look up values for more people.

```
> ix.race = sample(c("B", "W"), replace = T, 12)
> print(ix.race)
 [1] "W" "B" "W" "W" "B" "B" "B" "B" "W" "B" "W" "B"
> ix.income = sample(c(1:5), replace = T, 12)
> print(ix.income)
 [1] 5 3 3 5 1 4 4 4 1 4 3 3
> dist.insure.type[.(ix.race, ix.income)]
    race income.cate uninsured self bronze self non-bronze employer government
 1:    W           5       0.0        0.10            0.40     0.49       0.01
 2:    B           3       0.0        0.35            0.39     0.25       0.01
 3:    W           3       0.0        0.35            0.39     0.25       0.01
 4:    W           5       0.0        0.10            0.40     0.49       0.01
 5:    B           1       0.3        0.00            0.00     0.00       0.70
 6:    B           4       0.0        0.10            0.40     0.49       0.01
 7:    B           4       0.0        0.10            0.40     0.49       0.01
 8:    B           4       0.0        0.10            0.40     0.49       0.01
```

```
 9:    W           1       0.3        0.00            0.00     0.00       0.70
10:    B           4       0.0        0.10            0.40     0.49       0.01
11:    W           3       0.0        0.35            0.39     0.25       0.01
12:    B           3       0.0        0.35            0.39     0.25       0.01
> colsel = c("uninsured", "self bronze", "self non-bronze", "employer", "government")
> dist.insure.type[.(ix.race, ix.income), ..colsel]
>     uninsured self bronze self non-bronze employer government
 1:         0.0        0.10            0.40     0.49       0.01
 2:         0.0        0.35            0.39     0.25       0.01
 3:         0.0        0.35            0.39     0.25       0.01
 4:         0.0        0.10            0.40     0.49       0.01
 5:         0.3        0.00            0.00     0.00       0.70
 6:         0.0        0.10            0.40     0.49       0.01
 7:         0.0        0.10            0.40     0.49       0.01
 8:         0.0        0.10            0.40     0.49       0.01
 9:         0.3        0.00            0.00     0.00       0.70
10:         0.0        0.10            0.40     0.49       0.01
11:         0.0        0.35            0.39     0.25       0.01
12:         0.0        0.35            0.39     0.25       0.01
```

- PrEP DAP application form
- ADAP application form