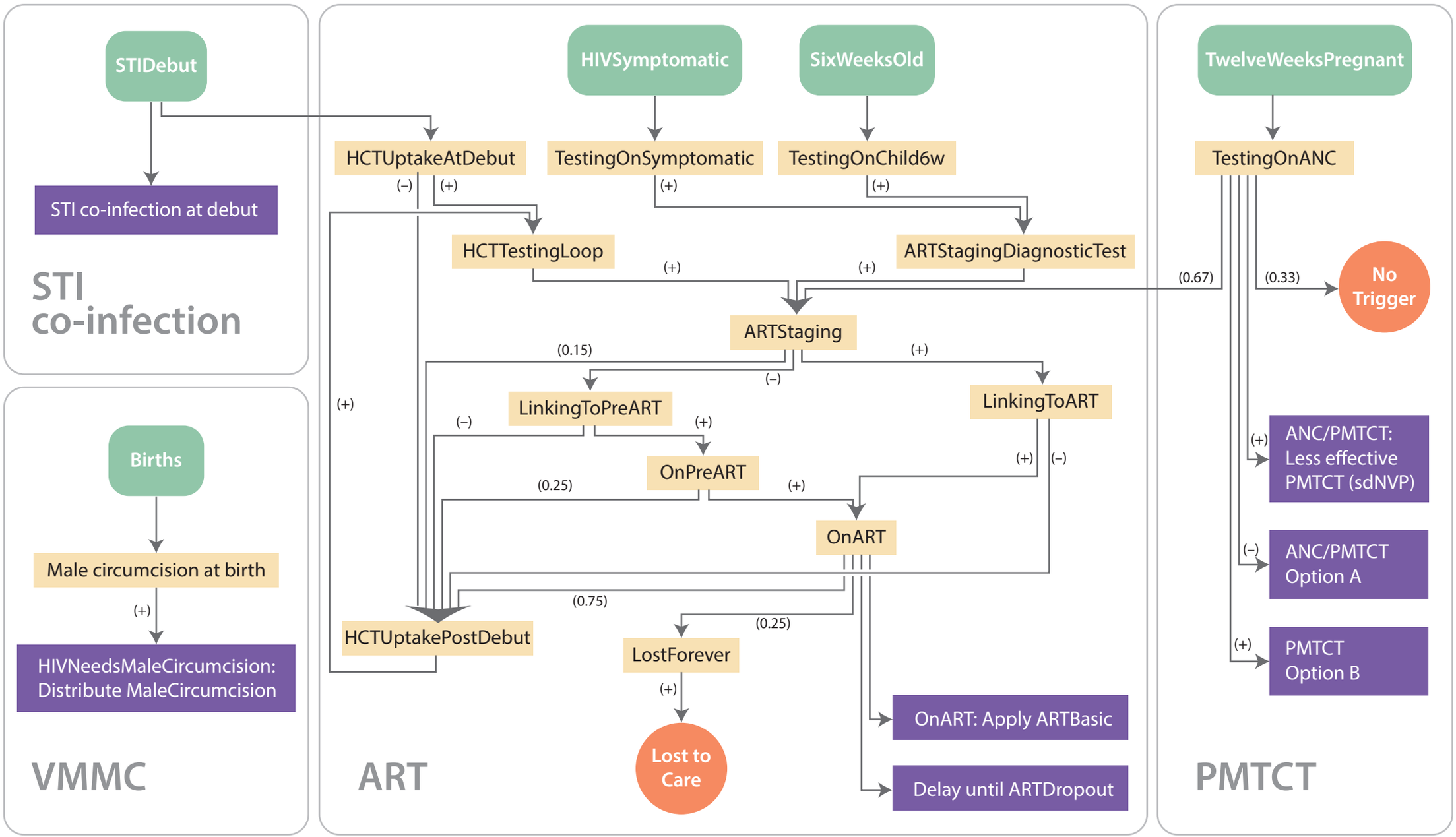
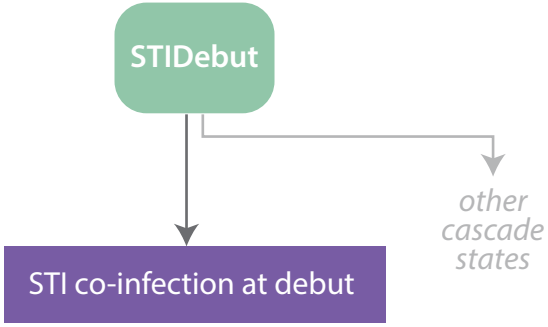
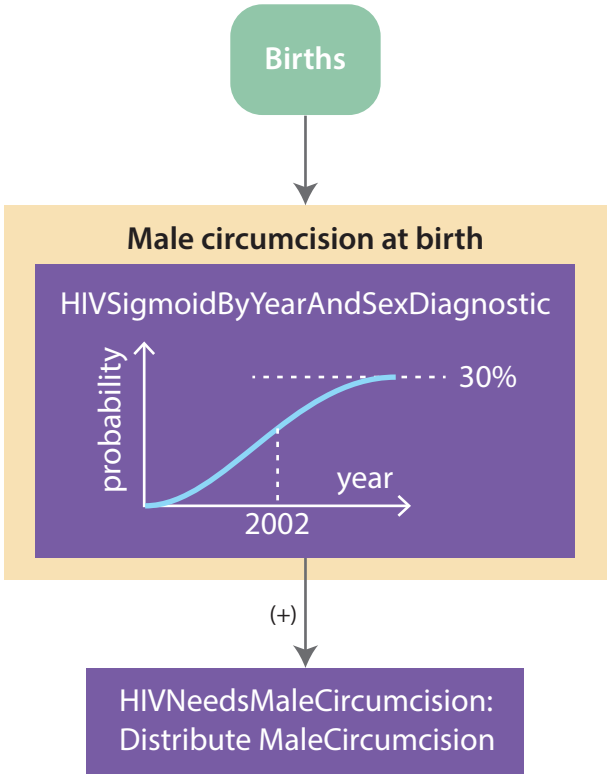
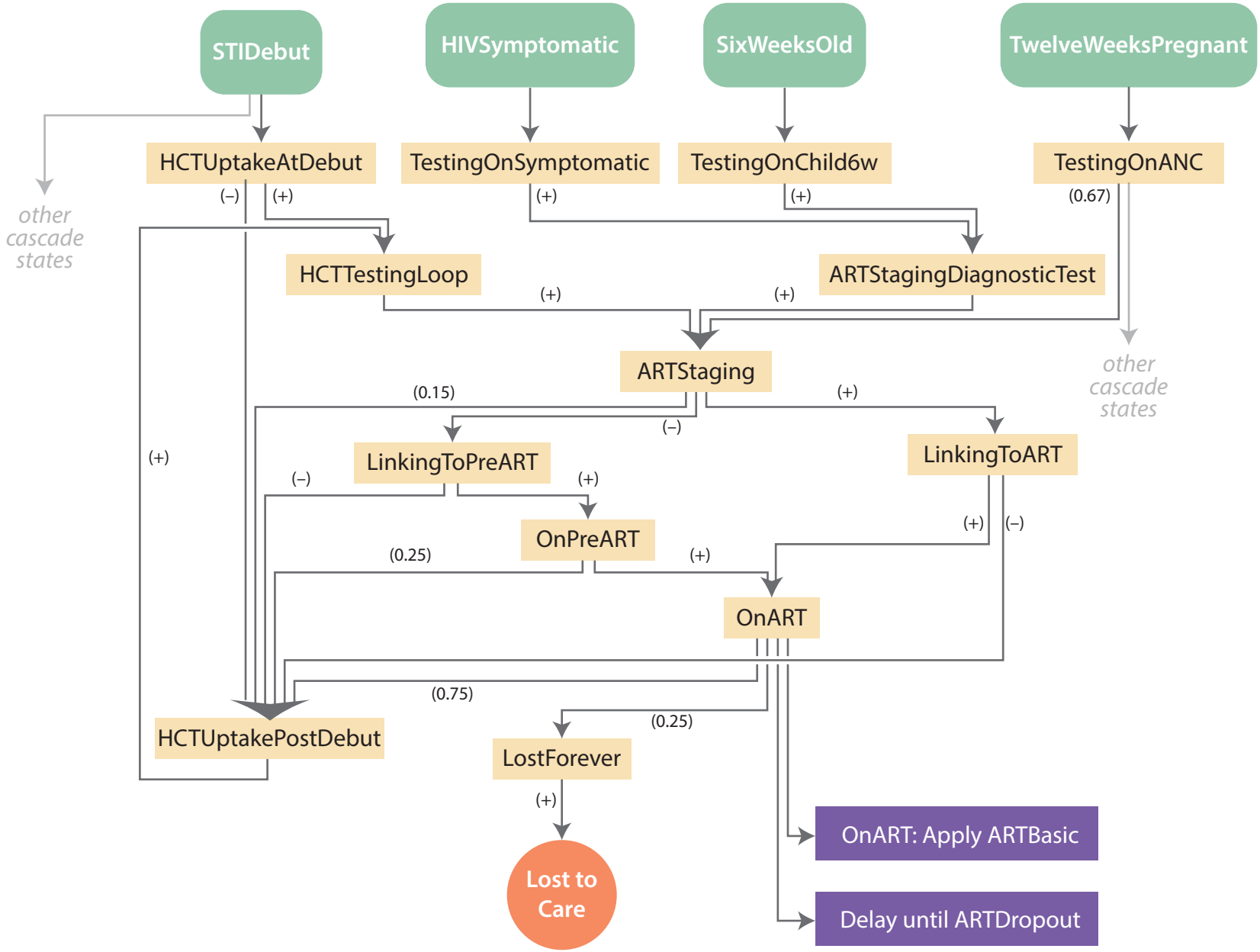
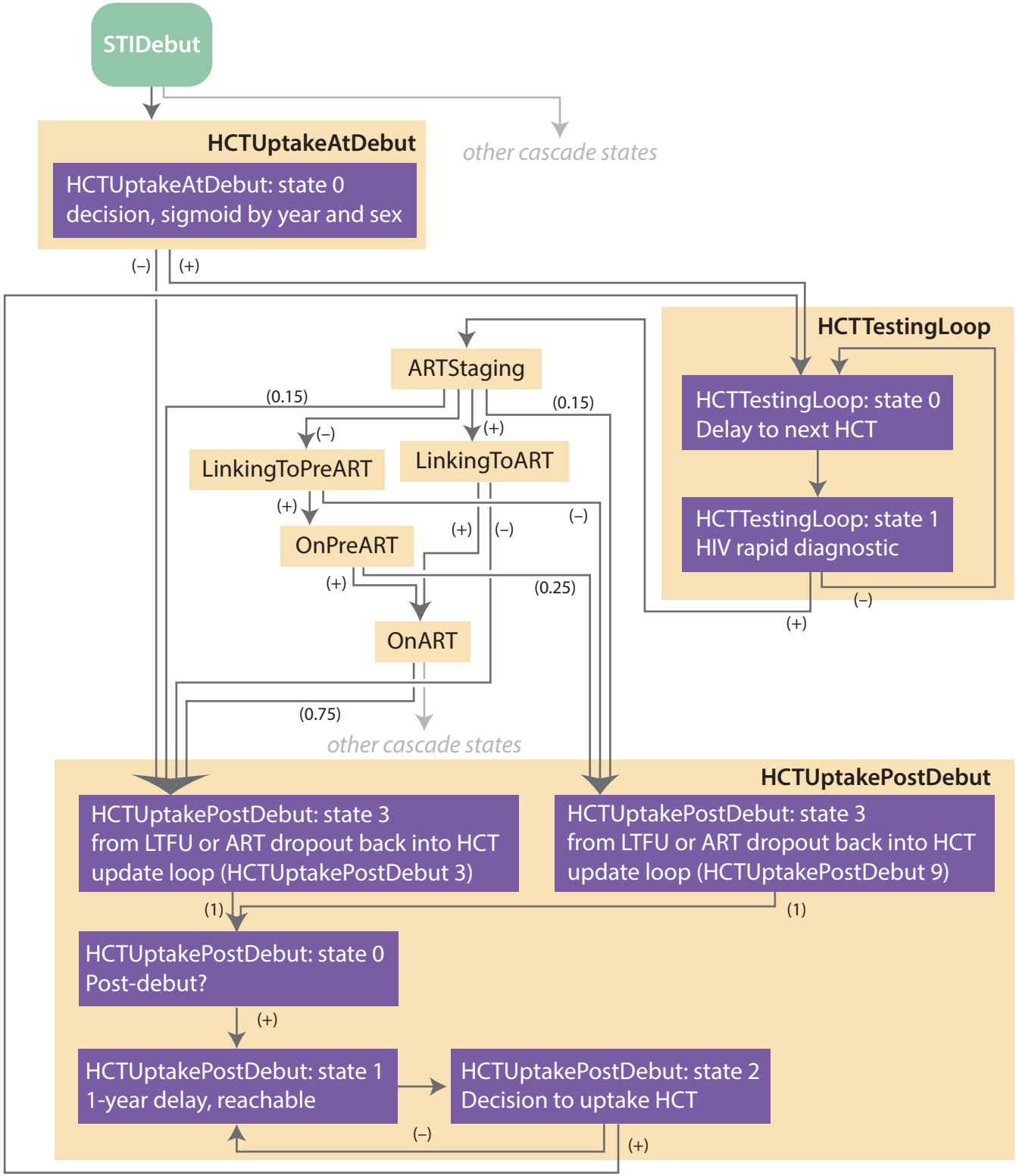
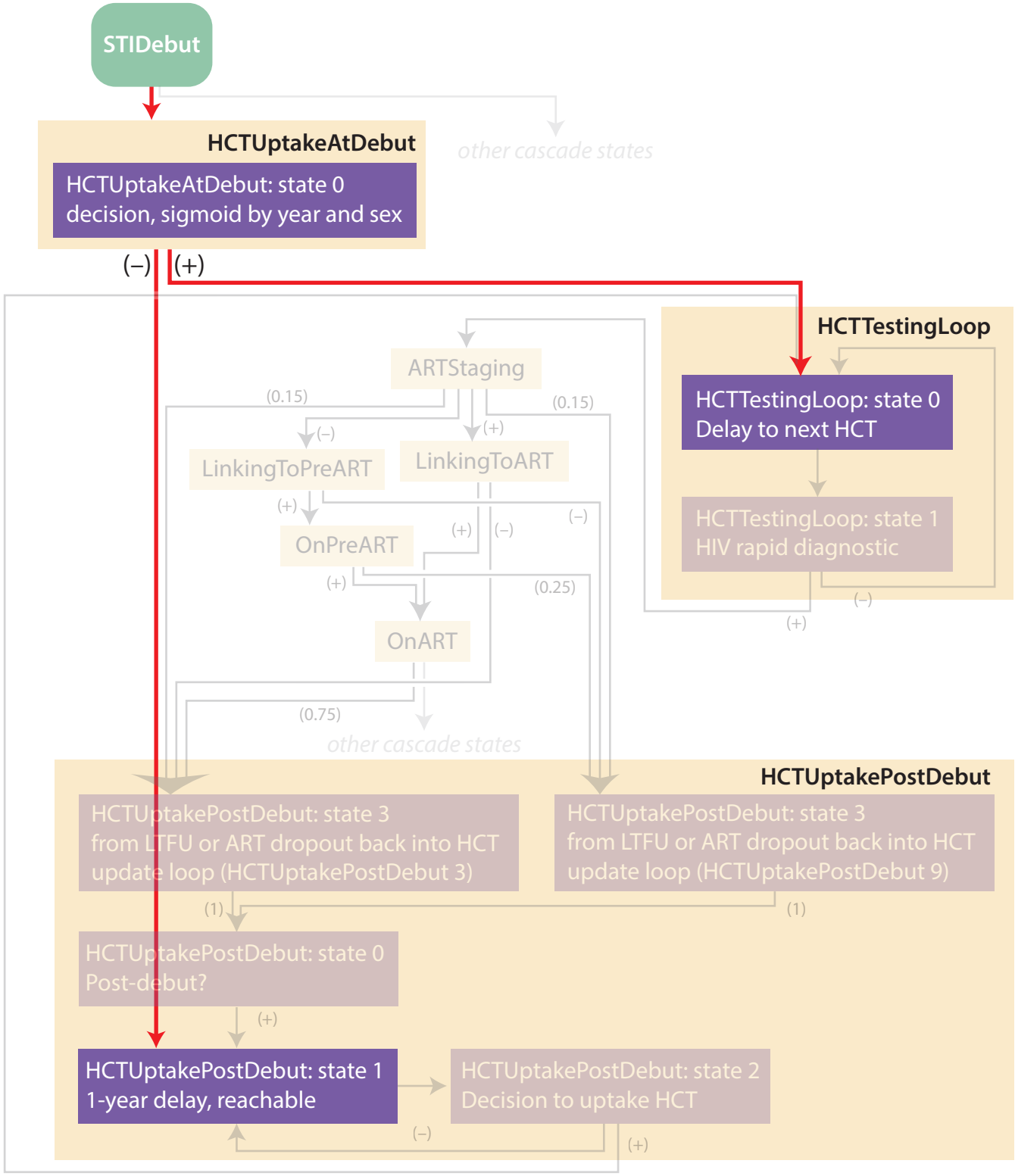

STIDebut
STI co-infection at debut
STI co-infection
Births
Male circumcision at birth
(+)
HIVNeedsMaleCircumcision: Distribute MaleCircumcision
VMMC
HIVSymptomatic
SixWeeksOld
HCTUptakeAtDebut
TestingOnSymptomatic
TestingOnChild6w
(–)
(+)
(+)
(+)
HCTTestingLoop
ARTStagingDiagnosticTest
(+)
(+)
ARTStaging
(0.15)
(+)
(–)
LinkingToPreART
LinkingToART
(+)
(–)
(+)
OnPreART
(+)
(–)
(0.25)
(+)
OnART
(0.75)
(0.25)
HCTUptakePostDebut
LostForever
(+)
Lost to Care
OnART: Apply ARTBasic
Delay until ARTDropout
ART
TwelveWeeksPregnant
TestingOnANC
(0.67)
(0.33)
No Trigger
(+)
ANC/PMTCT: Less effective PMTCT (sdNVP)
(–)
ANC/PMTCT Option A
(+)
PMTCT Option B
PMTCT

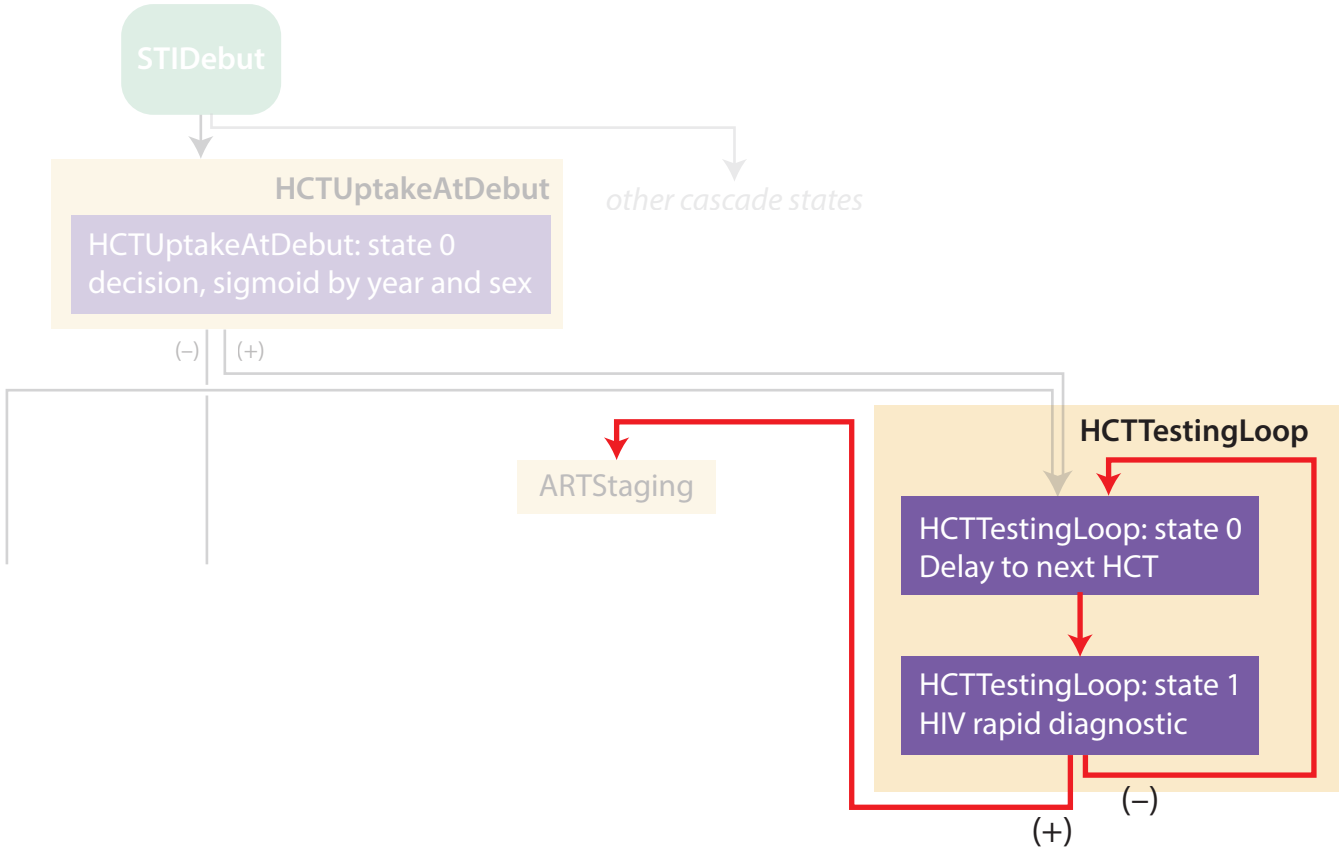

STIDebut
other cascade states
STI co-infection at debut

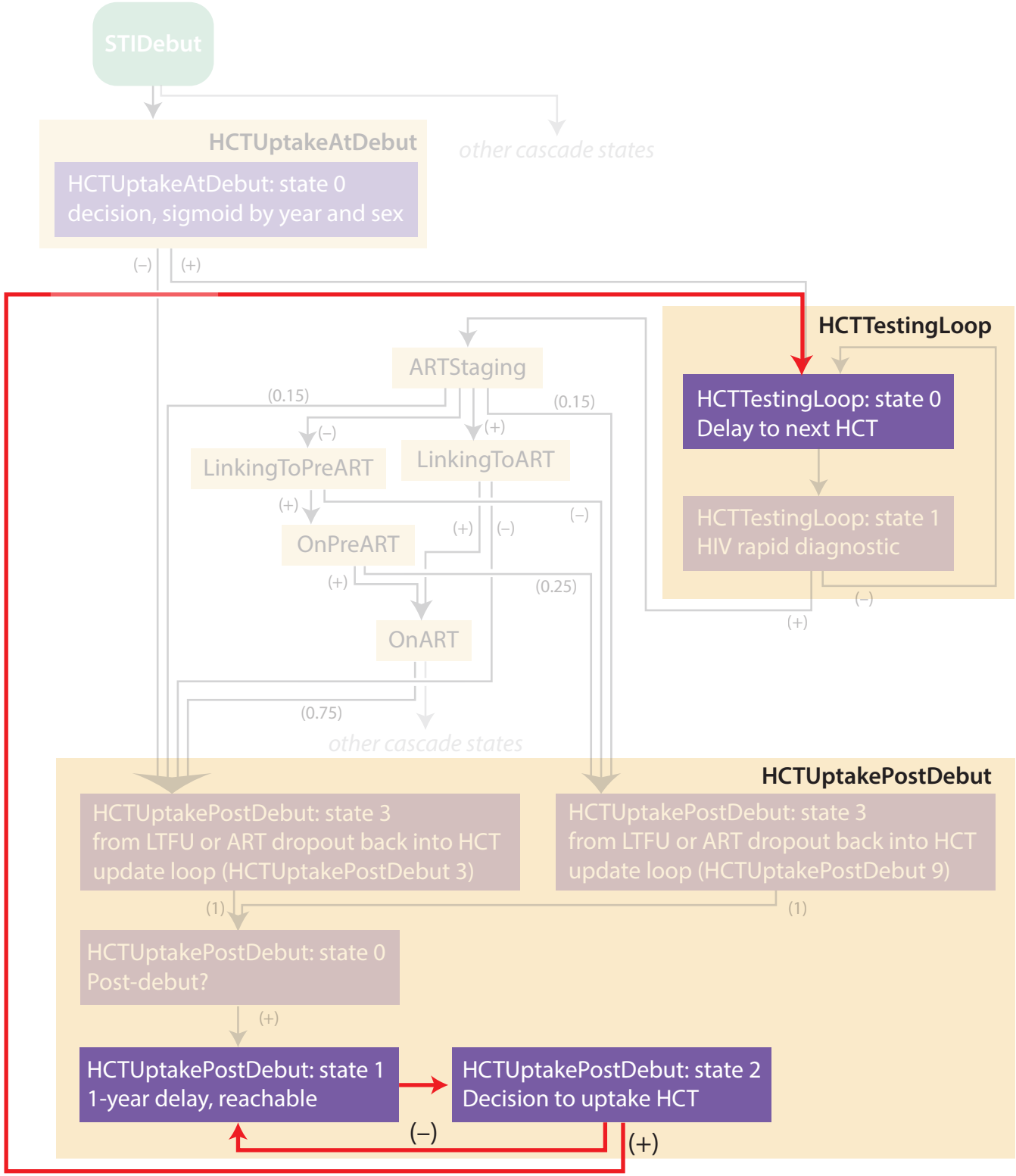

Births
Male circumcision at birth
HIVSigmoidByYearAndSexDiagnostic
probability
30%
year
2002
(+)
HIVNeedsMaleCircumcision:
Distribute MaleCircumcision

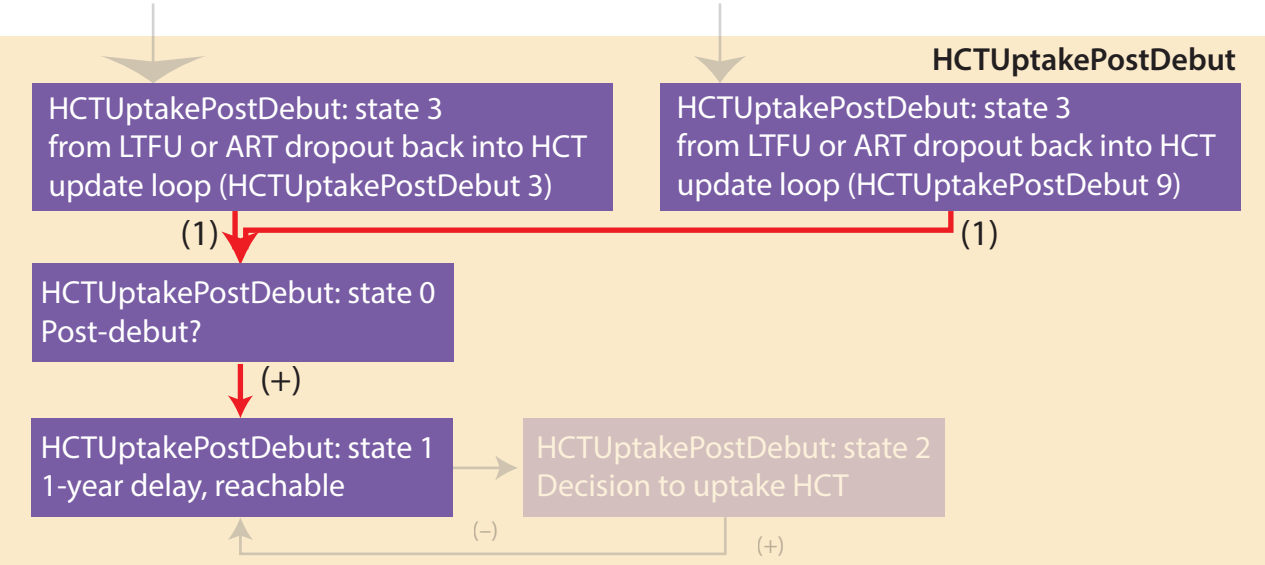

STIDebut
HIVSymptomatic
SixWeeksOld
TwelveWeeksPregnant
other cascade states
HCTUptakeAtDebut
TestingOnSymptomatic
TestingOnChild6w
TestingOnANC
(–)
(+)
(+)
(+)
(0.67)
HCTTestingLoop
ARTStagingDiagnosticTest
(+)
(+)
ARTStaging
other cascade states
(0.15)
(+)
(–)
LinkingToPreART
LinkingToART
(+)
(–)
(+)
OnPreART
(+)
(–)
(0.25)
(+)
OnART
(0.75)
(0.25)
HCTUptakePostDebut
LostForever
(+)
Lost to Care
OnART: Apply ARTBasic
Delay until ARTDropout

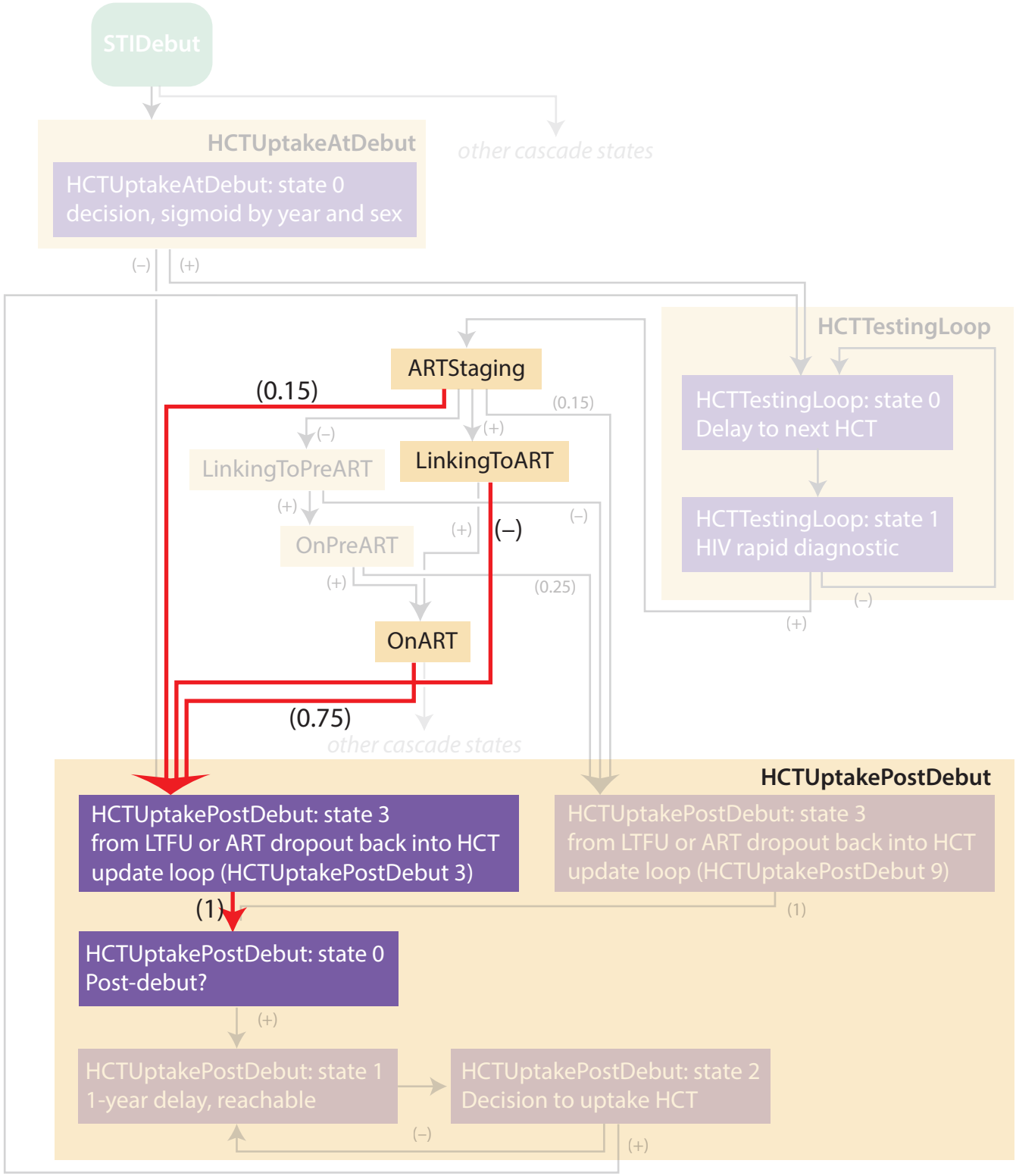

STIDebut
HCTUptakeAtDebut
HCTUptakeAtDebut: state 0
decision, sigmoid by year and sex
other cascade states
(–)
(+)
HCTTestingLoop
HCTTestingLoop: state 0
Delay to next HCT
HCTTestingLoop: state 1
HIV rapid diagnostic
(–)
(+)
ARTStaging
(0.15)
(0.15)
(–)
(+)
LinkingToPreART
LinkingToART
(+)
(–)
(+)
(–)
OnPreART
(+)
(0.25)
OnART
(0.75)
other cascade states
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)

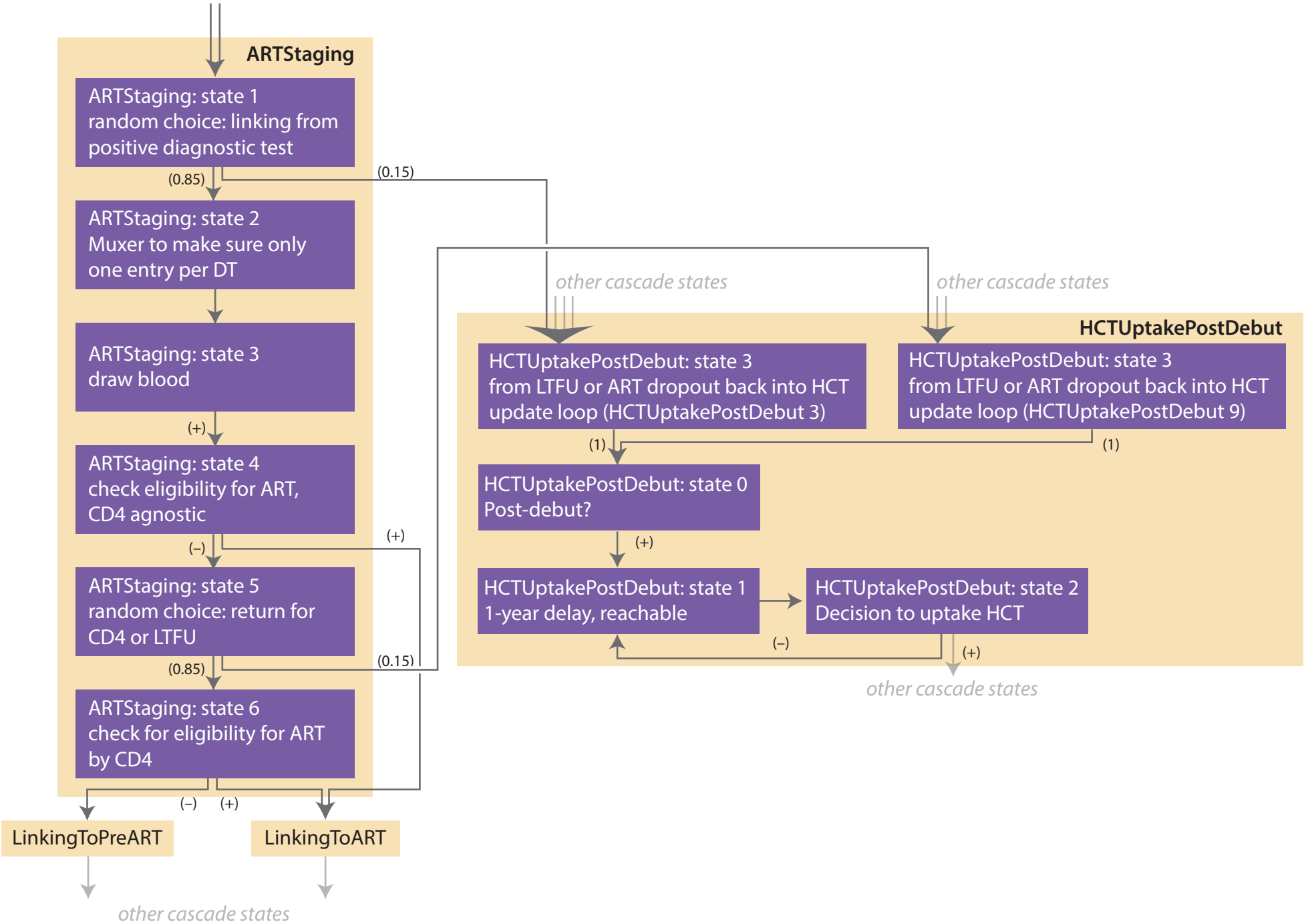

STIDebut
HCTUptakeAtDebut
HCTUptakeAtDebut: state 0
decision, sigmoid by year and sex
other cascade states
(–)
(+)
HCTTestingLoop
HCTTestingLoop: state 0
Delay to next HCT
HCTTestingLoop: state 1
HIV rapid diagnostic
(–)
(+)
ARTStaging
(0.15)
(0.15)
(–)
(+)
LinkingToPreART
LinkingToART
(+)
(–)
OnPreART
(+)
(–)
(+)
(0.25)
OnART
(0.75)
other cascade states
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)

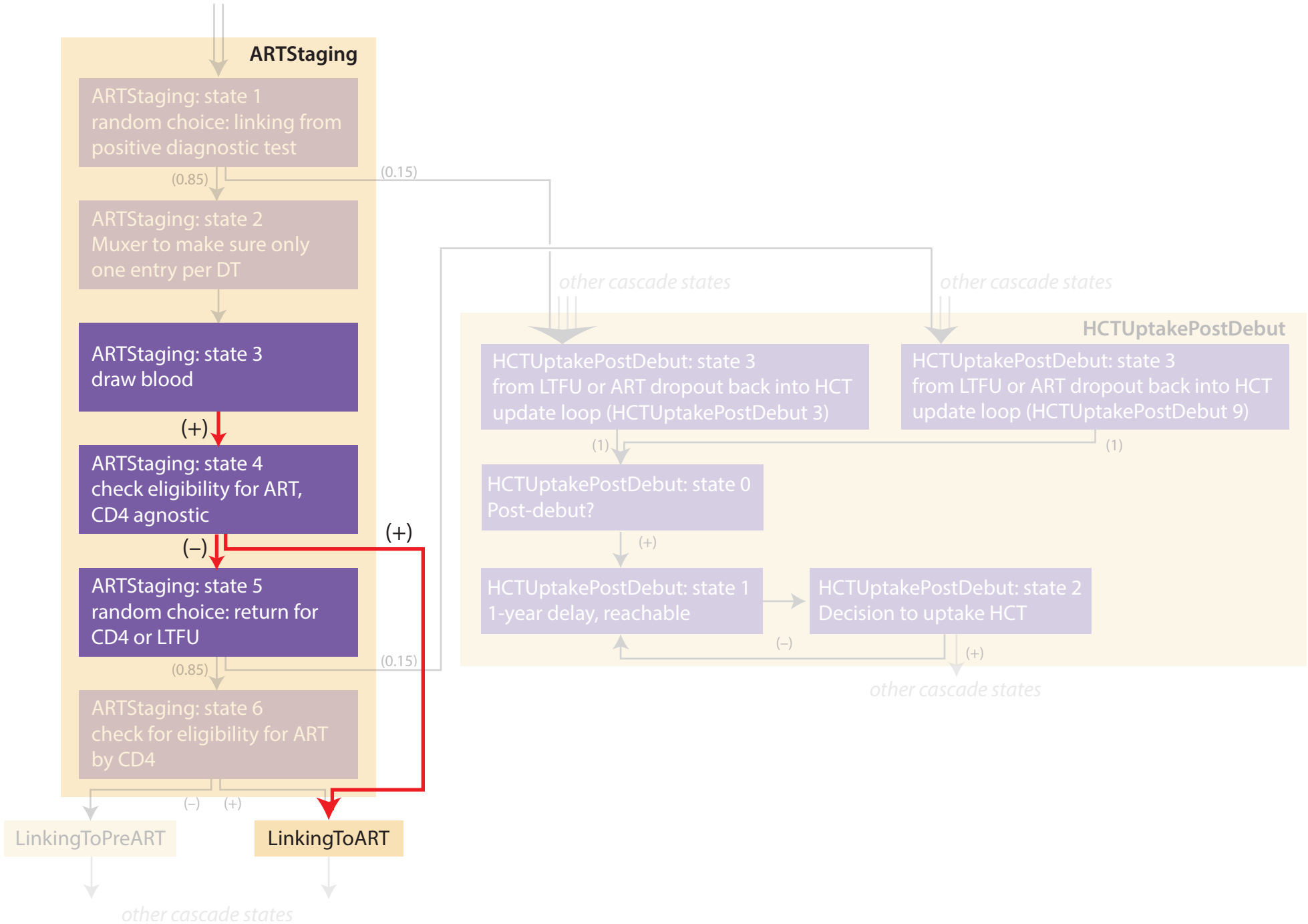

STIDebut
HCTUptakeAtDebut
HCTUptakeAtDebut: state 0
decision, sigmoid by year and sex
other cascade states
(–)
(+)
ARTStaging
HCTTestingLoop
HCTTestingLoop: state 0
Delay to next HCT
HCTTestingLoop: state 1
HIV rapid diagnostic
(–)
(+)

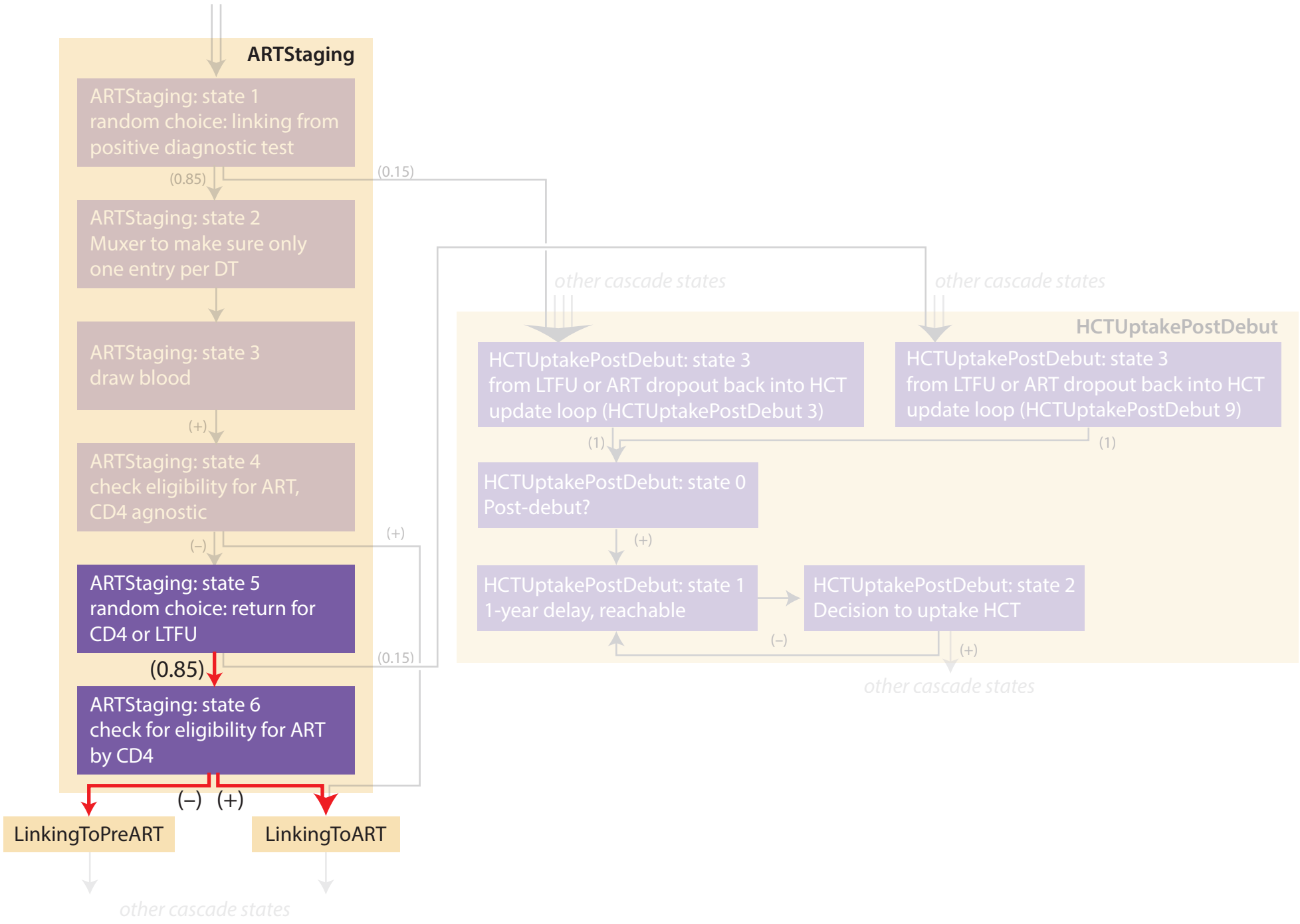

STIDebut
HCTUptakeAtDebut
HCTUptakeAtDebut: state 0
decision, sigmoid by year and sex
other cascade states
(–)
(+)
HCTTestingLoop
HCTTestingLoop: state 0
Delay to next HCT
HCTTestingLoop: state 1
HIV rapid diagnostic
(–)
(+)
ARTStaging
(0.15)
(0.15)
(–)
(+)
LinkingToPreART
LinkingToART
(+)
(–)
(+)
(–)
OnPreART
(+)
(0.25)
OnART
(0.75)
other cascade states
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)

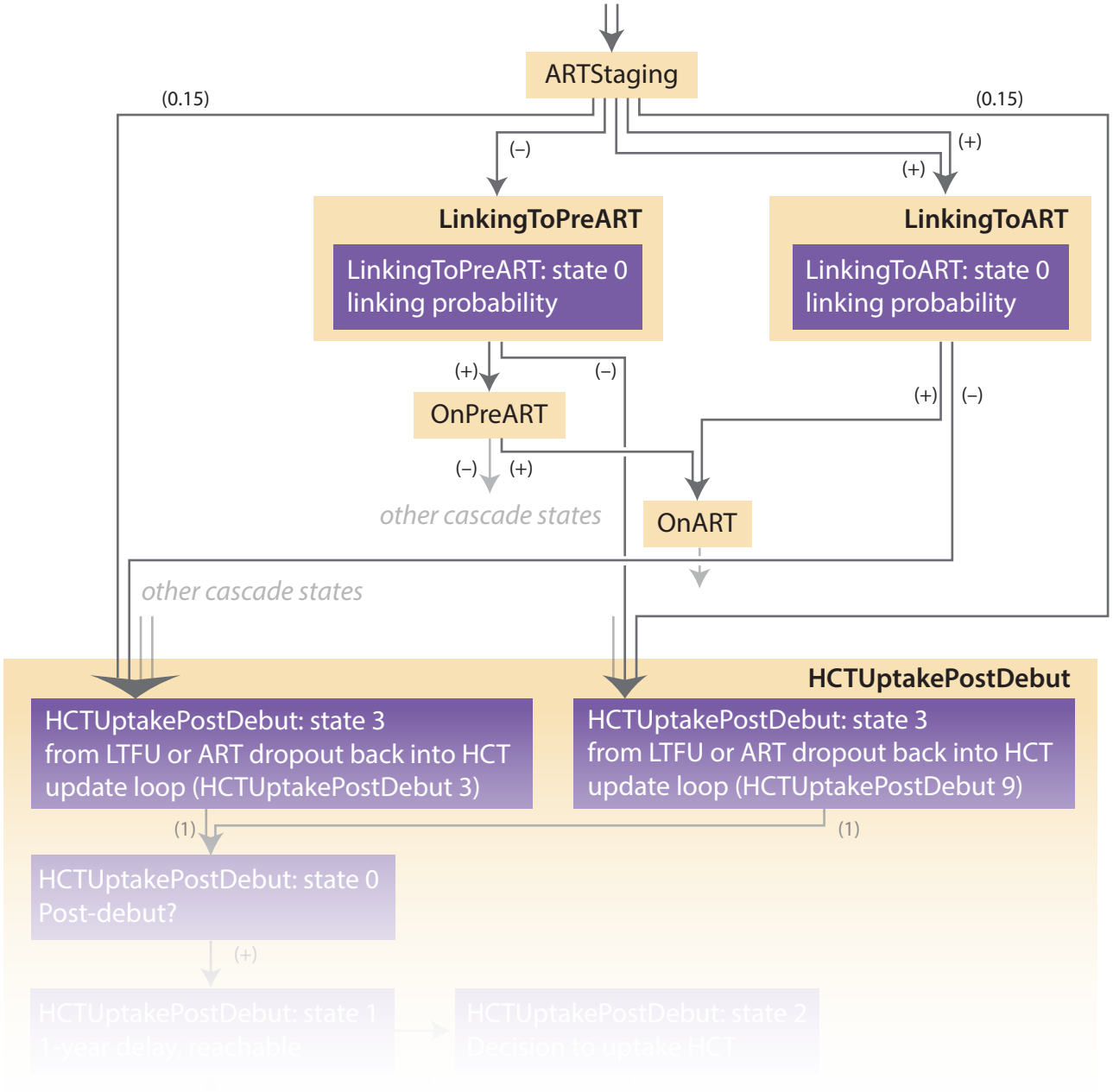

HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)

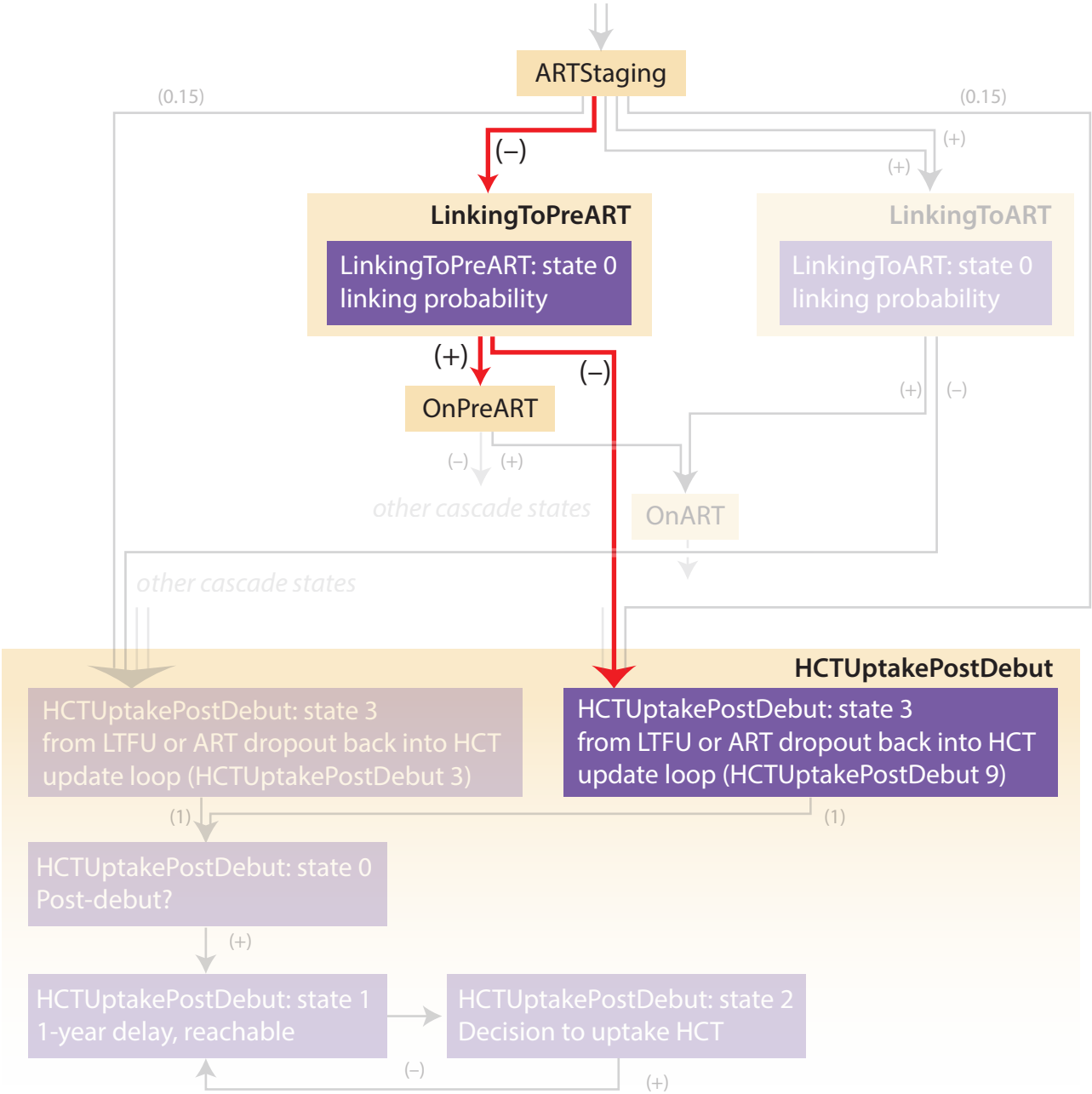

STIDebut
HCTUptakeAtDebut
HCTUptakeAtDebut: state 0
decision, sigmoid by year and sex
other cascade states
(–)
(+)
HCTTestingLoop
HCTTestingLoop: state 0
Delay to next HCT
HCTTestingLoop: state 1
HIV rapid diagnostic
ARTStaging
(0.15)
(0.15)
LinkingToPreART
LinkingToART
OnPreART
(–)
(0.25)
OnART
(0.75)
other cascade states
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 9)
(1)
HCTUptakePostDebut: state 0
Post-debut?
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT

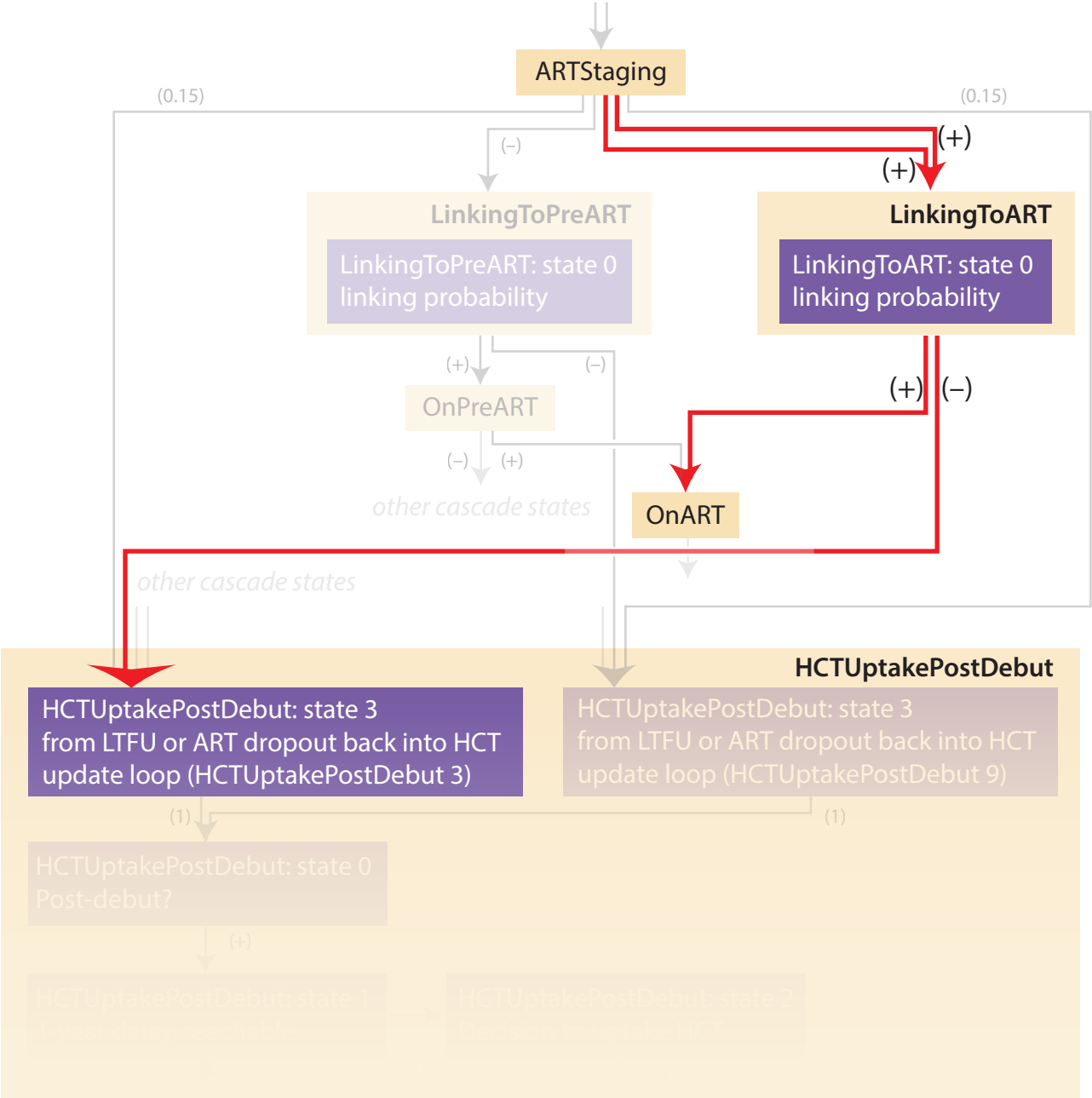

ARTStaging
ARTStaging: state 1
random choice: linking from positive diagnostic test
(0.85)
(0.15)
ARTStaging: state 2
Muxer to make sure only one entry per DT
ARTStaging: state 3
draw blood
(+)
ARTStaging: state 4
check eligibility for ART, CD4 agnostic
(–)
(+)
ARTStaging: state 5
random choice: return for CD4 or LTFU
(0.85)
(0.15)
ARTStaging: state 6
check for eligibility for ART by CD4
(–)
(+)
LinkingToPreART
LinkingToART
other cascade states
other cascade states
other cascade states
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)
other cascade states

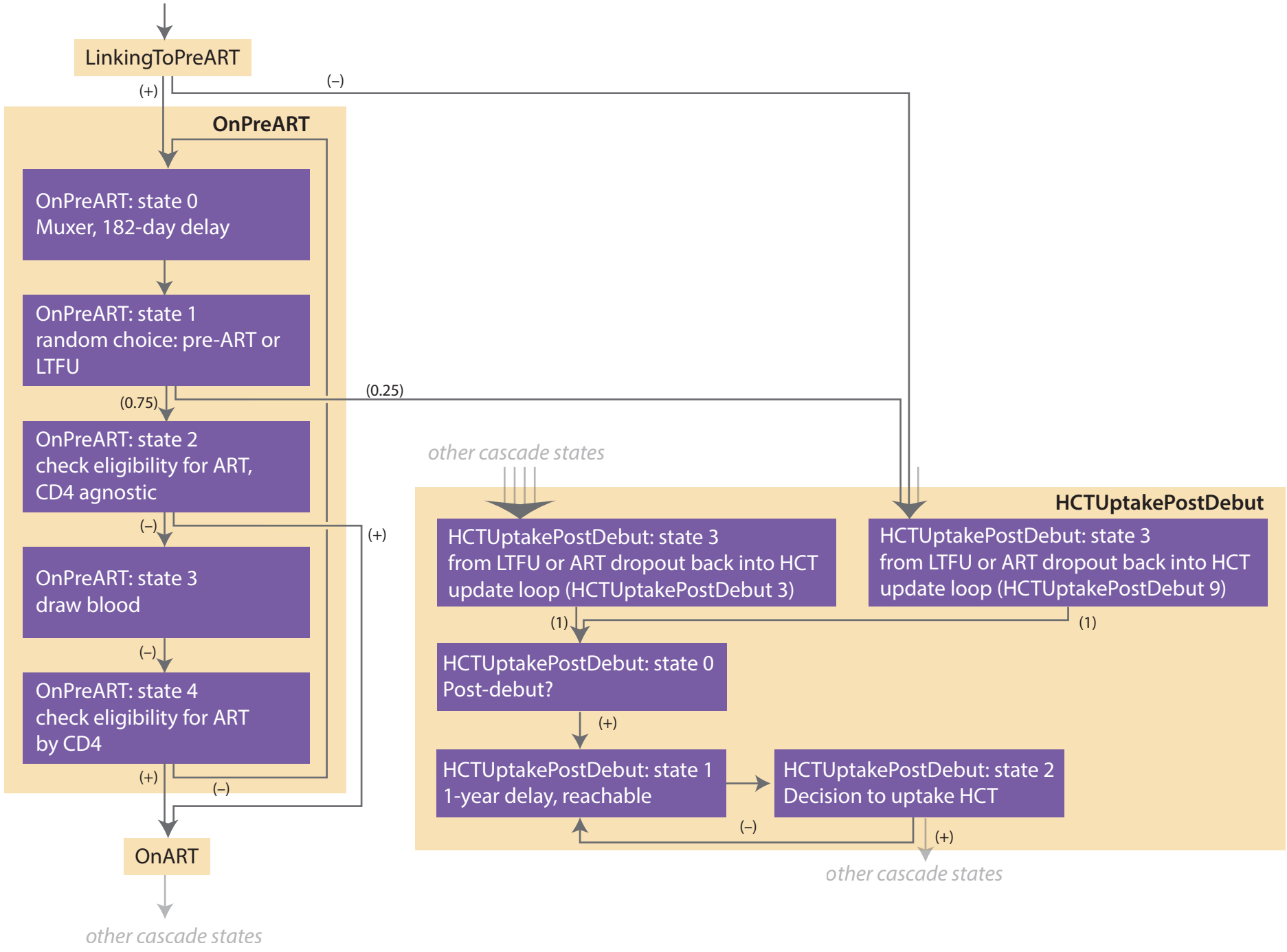

ARTStaging
ARTStaging: state 1
random choice: linking from positive diagnostic test
(0.85)
(0.15)
ARTStaging: state 2
Muxer to make sure only one entry per DT
ARTStaging: state 3
draw blood
(+)
ARTStaging: state 4
check eligibility for ART, CD4 agnostic
(–)
(+)
ARTStaging: state 5
random choice: return for CD4 or LTFU
(0.85)
(0.15)
ARTStaging: state 6
check for eligibility for ART by CD4
(–)
(+)
LinkingToPreART
LinkingToART
other cascade states
other cascade states
other cascade states
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)
other cascade states

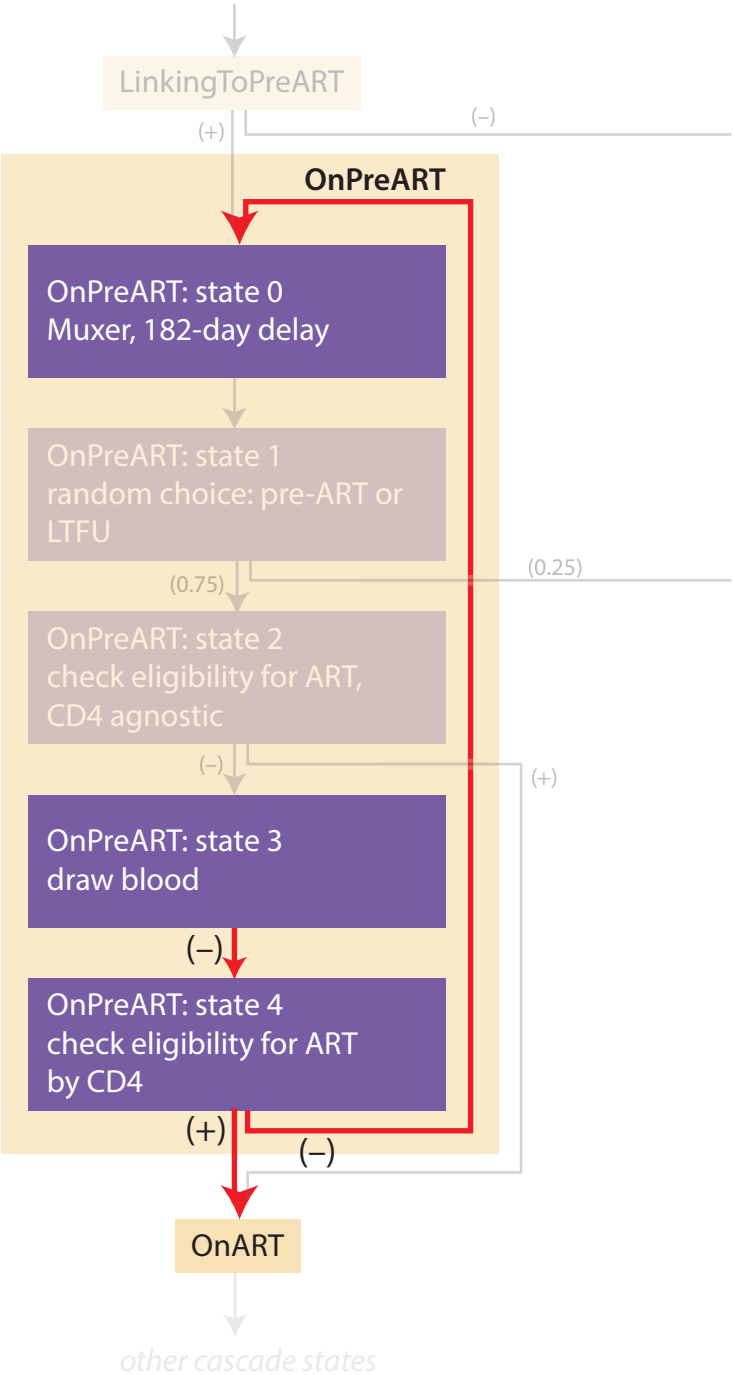

ARTStaging
ARTStaging: state 1
random choice: linking from positive diagnostic test
(0.85)
(0.15)
ARTStaging: state 2
Muxer to make sure only one entry per DT
ARTStaging: state 3
draw blood
(+)
ARTStaging: state 4
check eligibility for ART, CD4 agnostic
(–)
(+)
ARTStaging: state 5
random choice: return for CD4 or LTFU
(0.85)
(0.15)
ARTStaging: state 6
check for eligibility for ART by CD4
(–)
(+)
LinkingToPreART
LinkingToART
other cascade states
other cascade states
other cascade states
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)
other cascade states

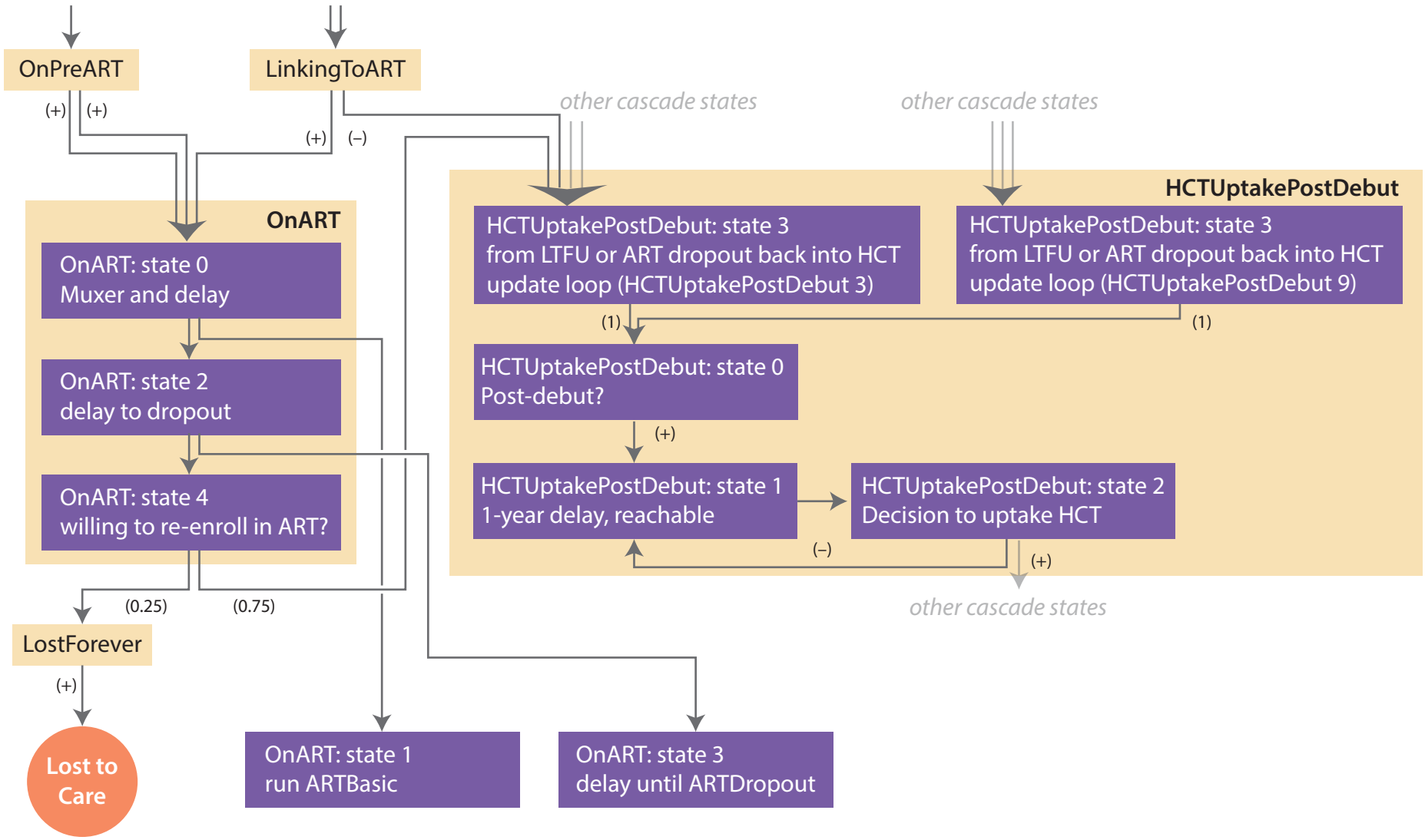

ARTStaging
(0.15)
(0.15)
(–)
(+)
(+)
LinkingToPreART
LinkingToPreART: state 0
linking probability
LinkingToART
LinkingToART: state 0
linking probability
(+)
(–)
(+)
(–)
OnPreART
(–)
(+)
other cascade states
OnART
other cascade states
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT

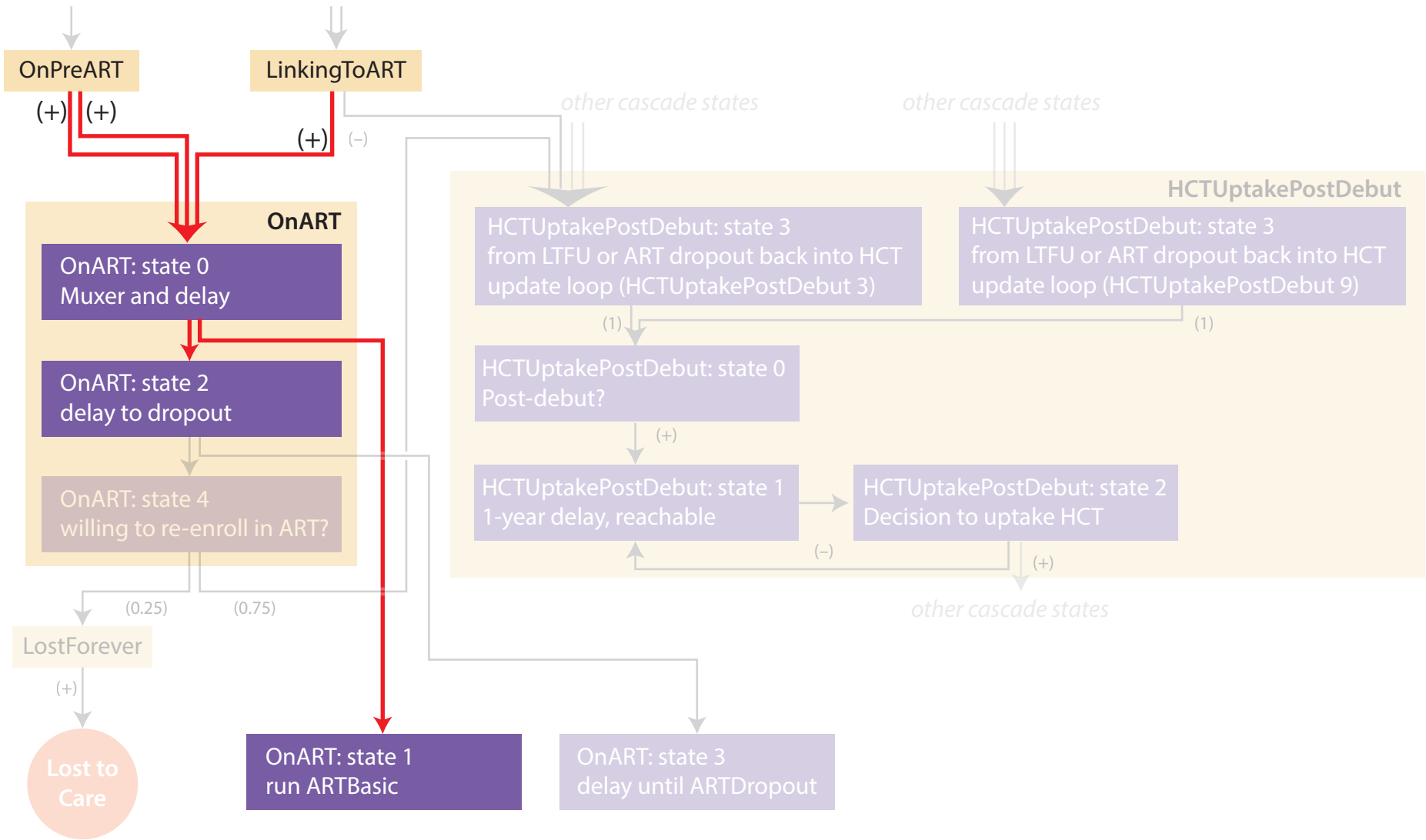

ARTStaging
(0.15)
(0.15)
(–)
(+)
(+)
LinkingToPreART
LinkingToPreART: state 0
linking probability
LinkingToART
LinkingToART: state 0
linking probability
(+)
(–)
OnPreART
(+)
(–)
(–)
(+)
other cascade states
OnART
other cascade states
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)

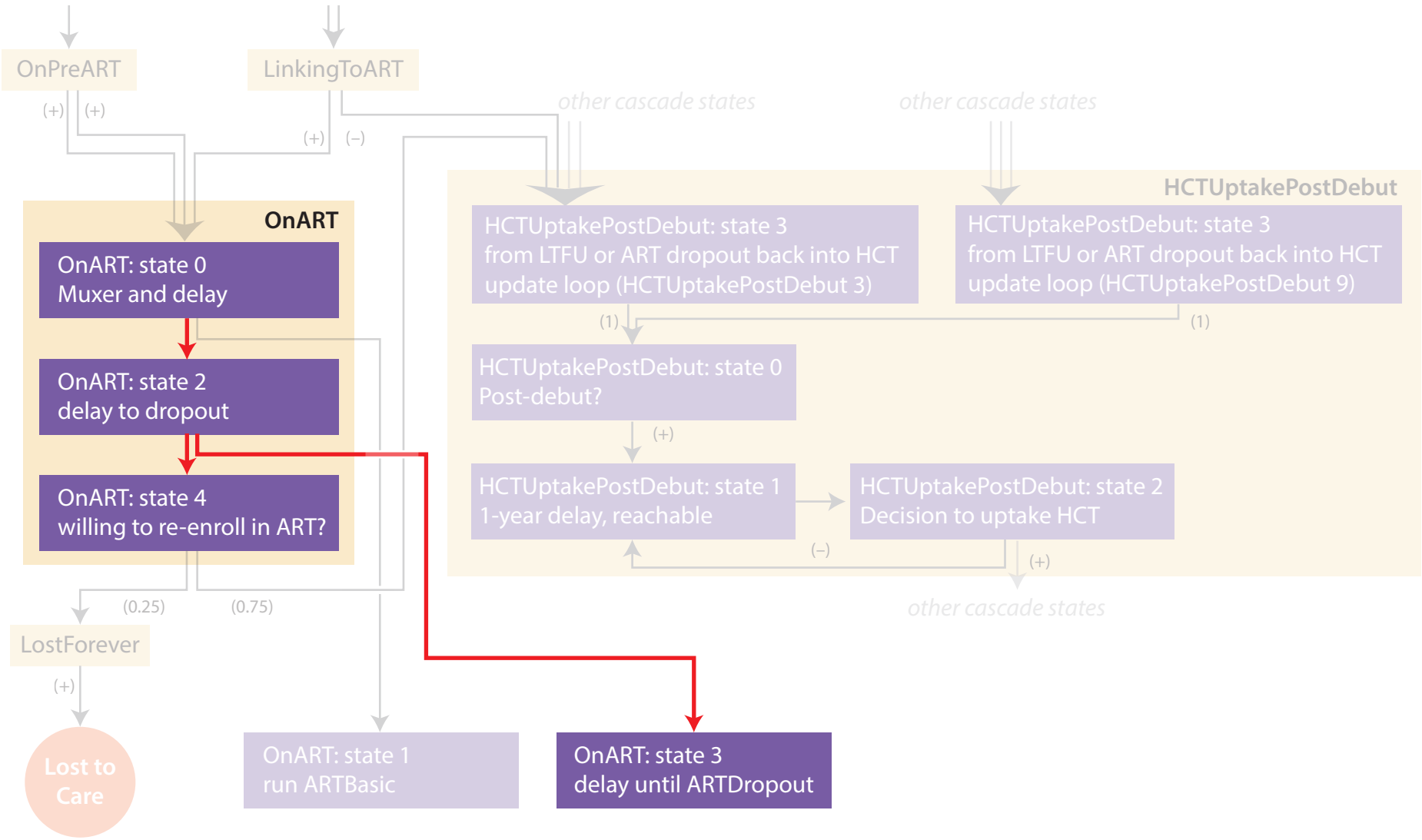

ARTStaging
(0.15)
(0.15)
(–)
(+)
(+)
LinkingToPreART
LinkingToPreART: state 0
linking probability
LinkingToART
LinkingToART: state 0
linking probability
(+)
(–)
OnPreART
(+)
(–)
(–)
(+)
other cascade states
OnART
other cascade states
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1 year delay, reachable
HCTUptakePostDebut: state 2
Decision to initiate HCT

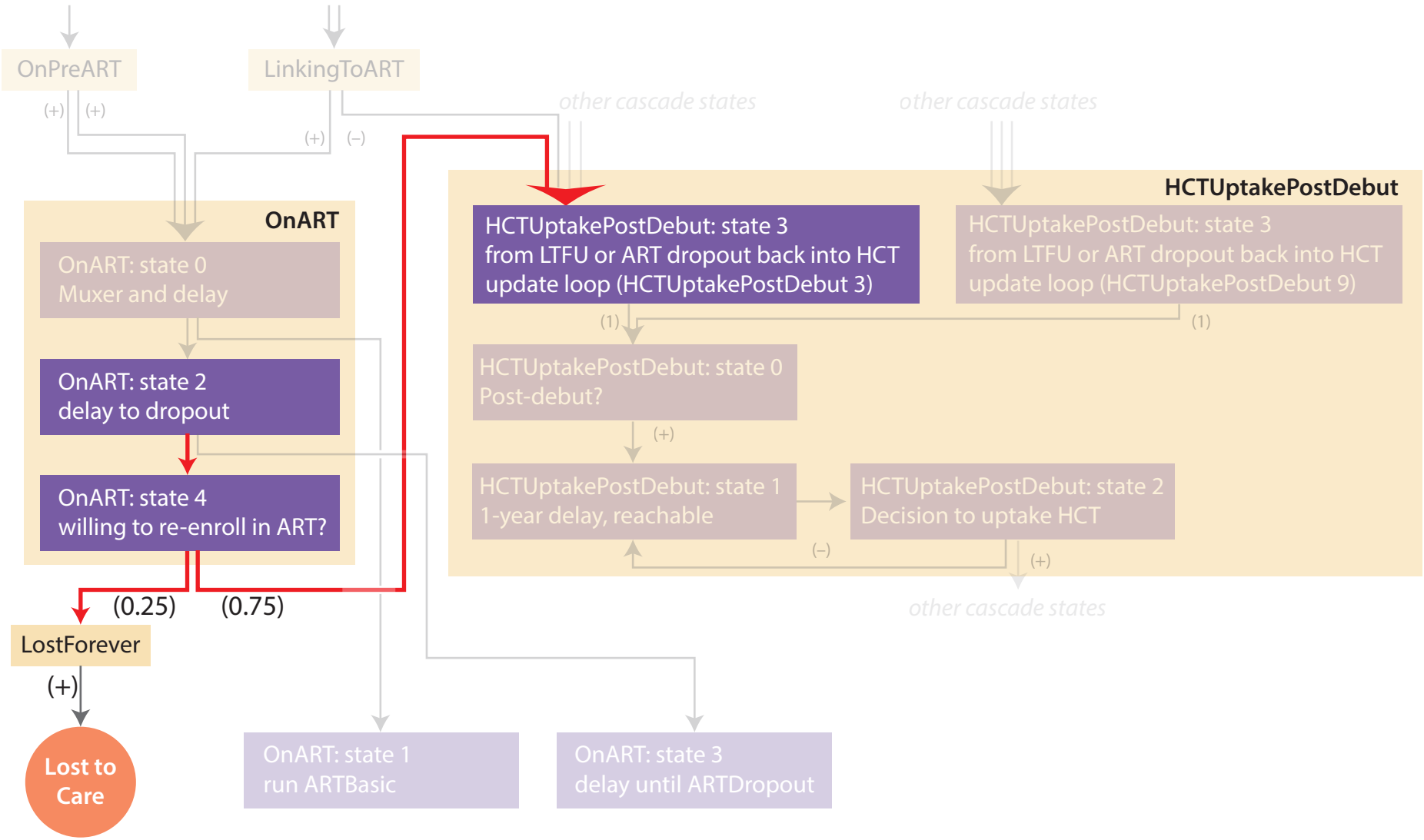

LinkingToPreART
(+)
(–)
OnPreART
OnPreART: state 0
Muxer, 182-day delay
OnPreART: state 1
random choice: pre-ART or LTFU
(0.75)
(0.25)
OnPreART: state 2
check eligibility for ART, CD4 agnostic
(–)
(+)
OnPreART: state 3
draw blood
(–)
OnPreART: state 4
check eligibility for ART by CD4
(+)
(–)
OnART
other cascade states
other cascade states
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)
other cascade states


LinkingToPreART
(+)
(–)
OnPreART
OnPreART: state 0
Muxer, 182-day delay
OnPreART: state 1
random choice: pre-ART or LTFU
(0.75)
(0.25)
OnPreART: state 2
check eligibility for ART, CD4 agnostic
(–)
(+)
OnPreART: state 3
draw blood
(–)
OnPreART: state 4
check eligibility for ART by CD4
(+)
(–)
OnART
other cascade states


OnPreART
LinkingToART
(+)
(+)
(+)
(–)
other cascade states
other cascade states
OnART
OnART: state 0
Muxer and delay
OnART: state 2
delay to dropout
OnART: state 4
willing to re-enroll in ART?
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)
other cascade states
(0.25)
(0.75)
LostForever
(+)
Lost to Care
OnART: state 1
run ARTBasic
OnART: state 3
delay until ARTDropout


OnPreART
LinkingToART
(+)
(+)
(+)
(–)
other cascade states
other cascade states
HCTUptakePostDebut
OnART
OnART: state 0
Muxer and delay
OnART: state 2
delay to dropout
OnART: state 4
willing to re-enroll in ART?
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)
other cascade states
(0.25)
(0.75)
LostForever
(+)
Lost to Care
OnART: state 1
run ARTBasic
OnART: state 3
delay until ARTDropout


OnPreART
LinkingToART
(+)
(+)
(+)
(–)
other cascade states
other cascade states
OnART
OnART: state 0
Muxer and delay
OnART: state 2
delay to dropout
OnART: state 4
willing to re-enroll in ART?
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT
update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)
other cascade states
(0.25)
(0.75)
LostForever
(+)
Lost to Care
OnART: state 1
run ARTBasic
OnART: state 3
delay until ARTDropout


OnPreART
LinkingToART
(+)
(+)
(+)
(–)
other cascade states
other cascade states
OnART
OnART: state 0
Muxer and delay
OnART: state 2
delay to dropout
OnART: state 4
willing to re-enroll in ART?
(0.25)
(0.75)
LostForever
(+)
Lost to Care
OnART: state 1
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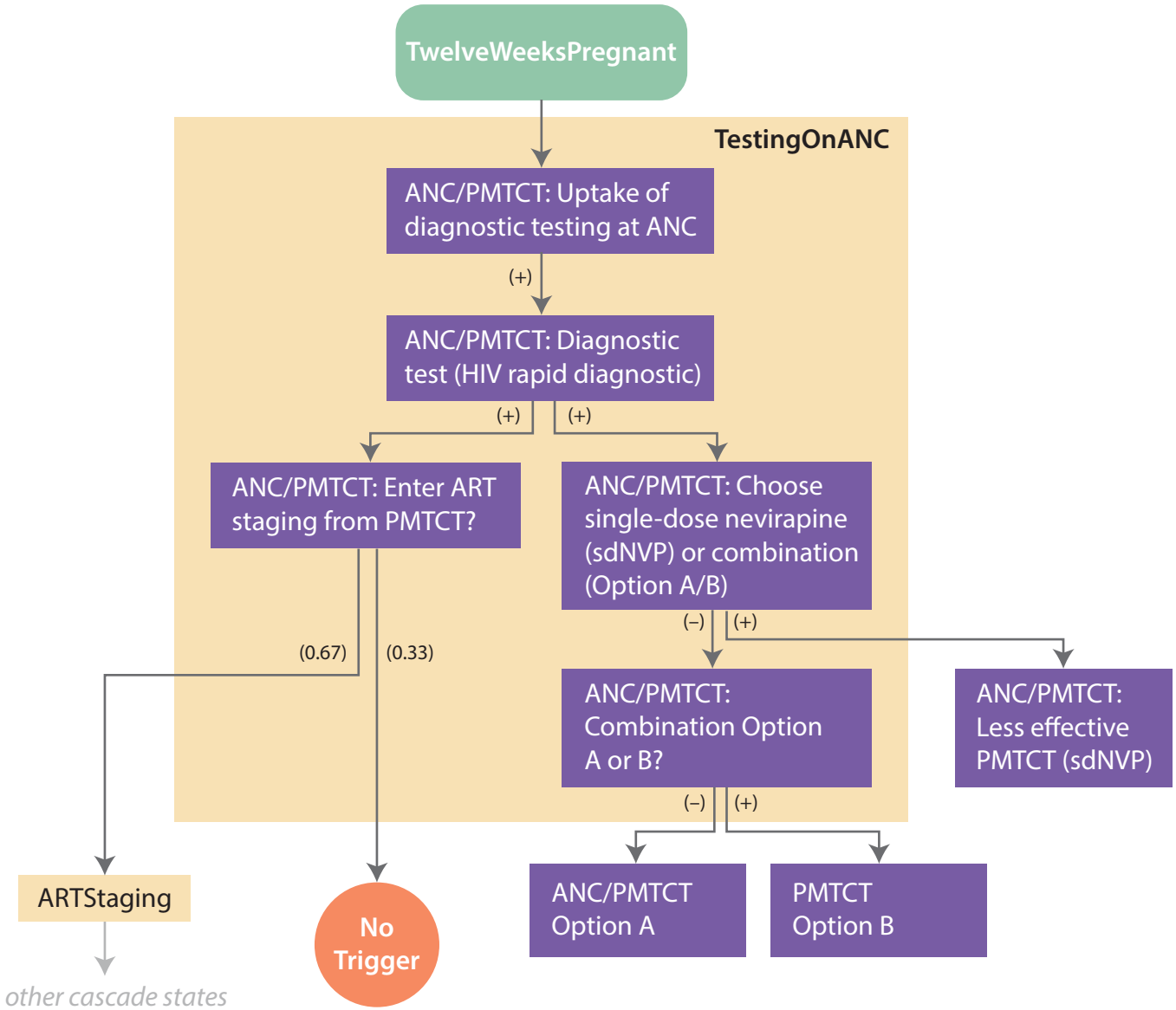
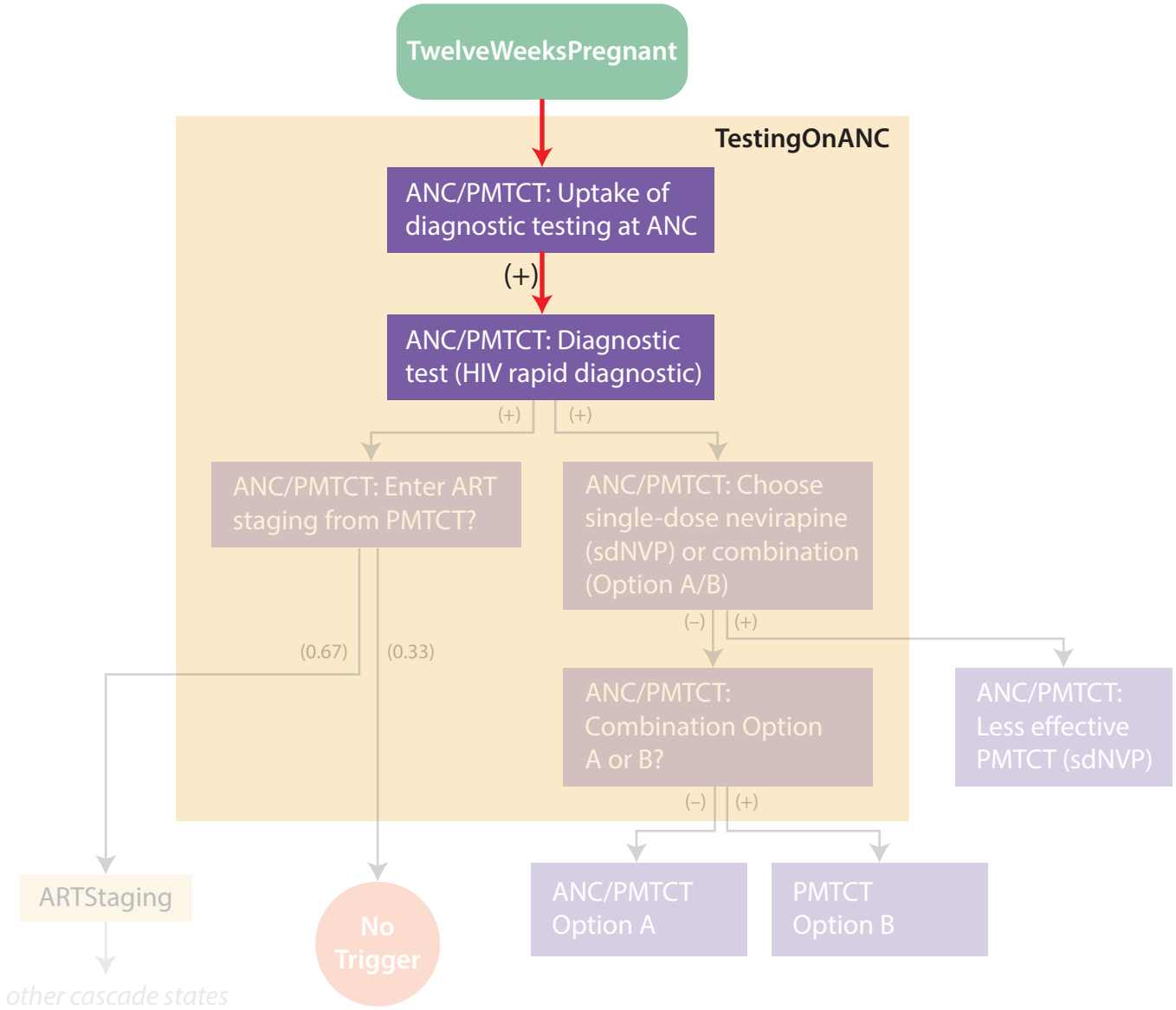
delay until ARTDropout
HCTUptakePostDebut
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT update loop (HCTUptakePostDebut 3)
HCTUptakePostDebut: state 3
from LTFU or ART dropout back into HCT update loop (HCTUptakePostDebut 9)
(1)
(1)
HCTUptakePostDebut: state 0
Post-debut?
(+)
HCTUptakePostDebut: state 1
1-year delay, reachable
HCTUptakePostDebut: state 2
Decision to uptake HCT
(–)
(+)
other cascade states


TwelveWeeksPregnant
TestingOnANC
ANC/PMTCT: Uptake of diagnostic testing at ANC
(+)
ANC/PMTCT: Diagnostic test (HIV rapid diagnostic)
(+)
(+)
ANC/PMTCT: Enter ART staging from PMTCT?
ANC/PMTCT: Choose single-dose nevirapine (sdNVP) or combination (Option A/B)
(0.67)
(0.33)
(–)
(+)
ANC/PMTCT: Combination Option A or B?
ANC/PMTCT: Less effective PMTCT (sdNVP)
(–)
(+)
ARTStaging
other cascade states
No Trigger
ANC/PMTCT Option A
PMTCT Option B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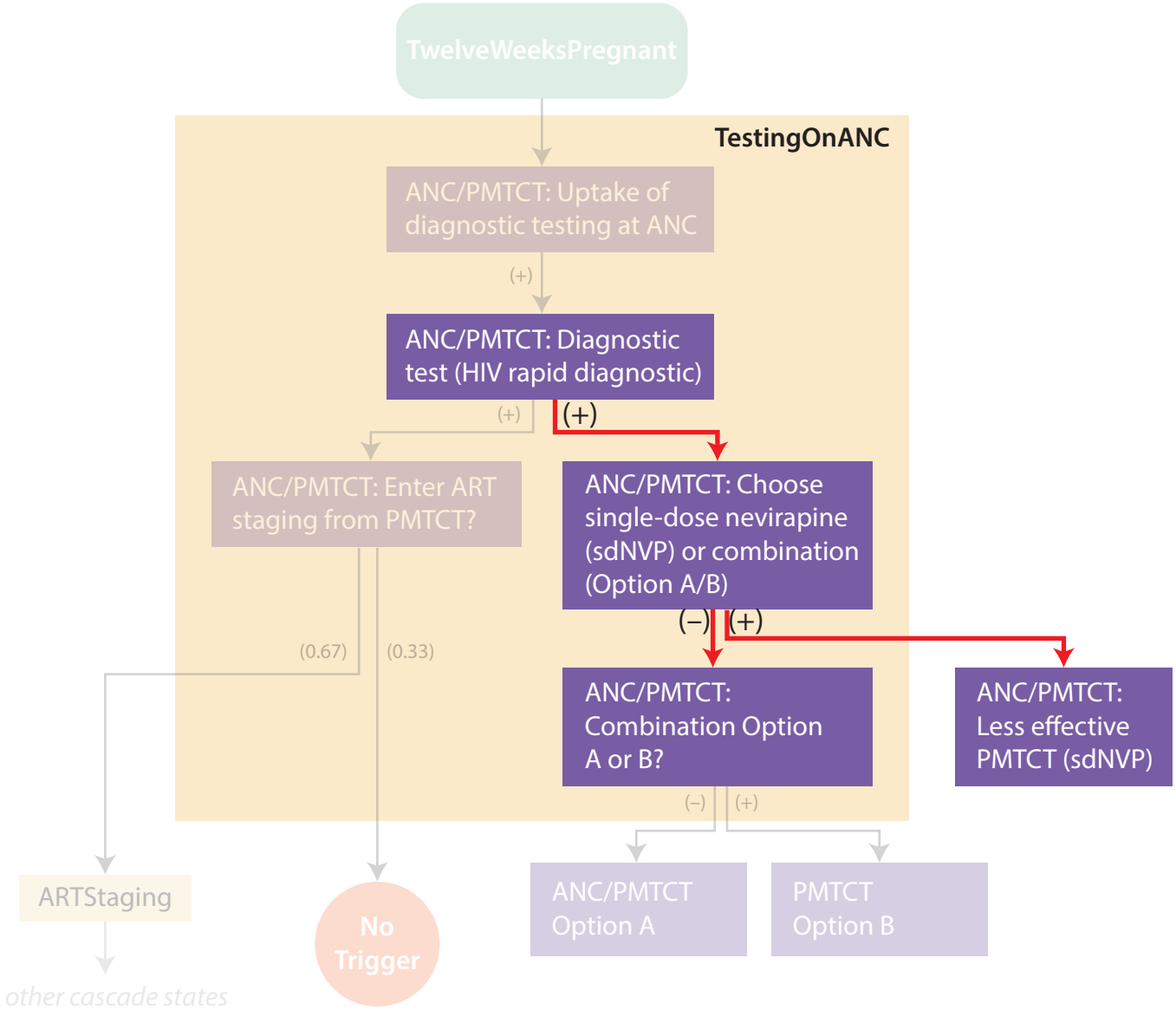
(0.33)
(–)
(+)
ANC/PMTCT: Combination Option A or B?
ANC/PMTCT: Less effective PMTCT (sdNVP)
(–)
(+)
ARTStaging
other cascade states
No Trigger
ANC/PMTCT Option A
PMTCT Option B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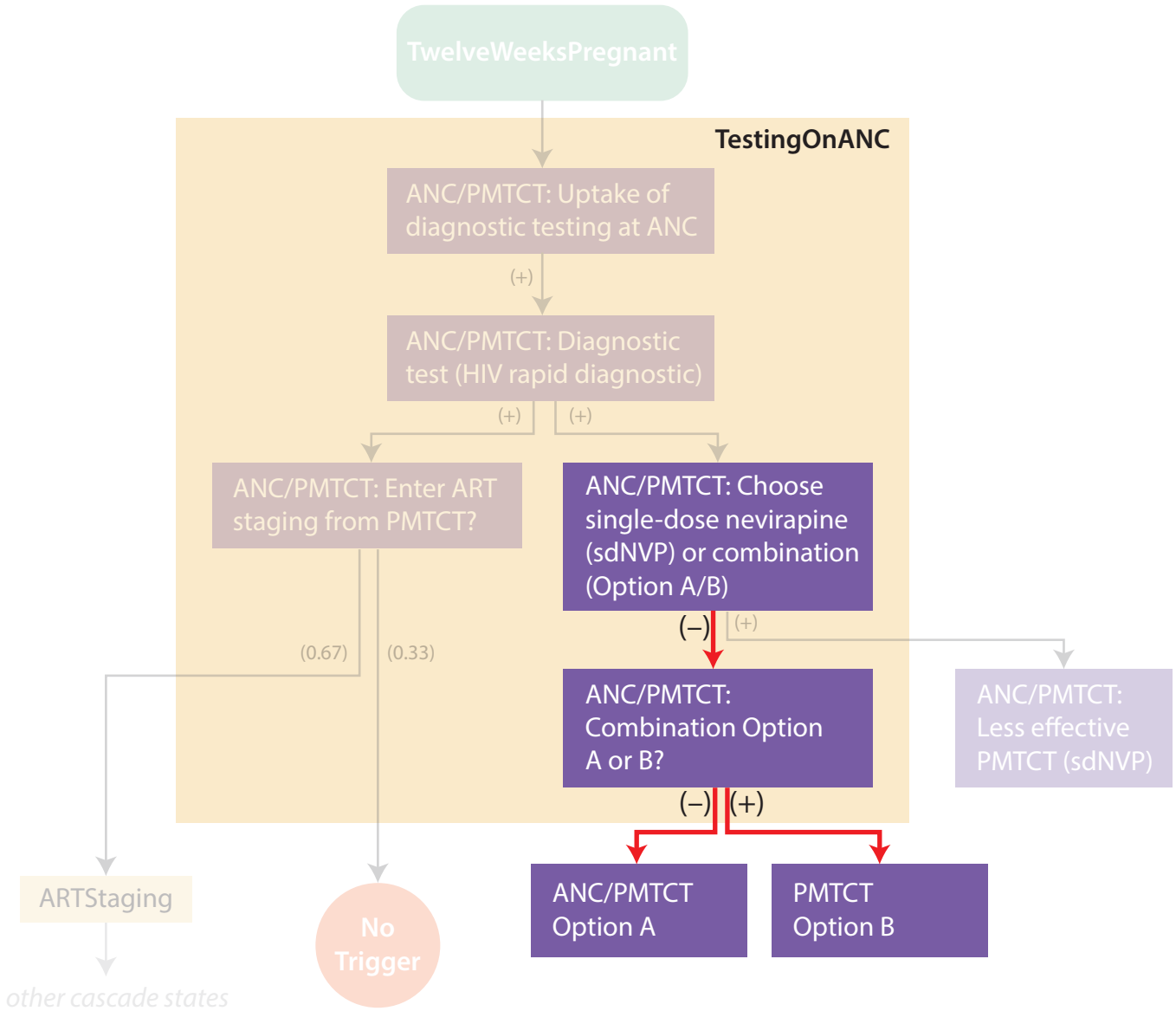
(0.33)
ANC/PMTCT: Combination Option A or B?
ANC/PMTCT: Less effective PMTCT (sdNVP)
(–)
(+)
ARTStaging
No Trigger
ANC/PMTCT Option A
PMTCT Option B
other cascade states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(–)
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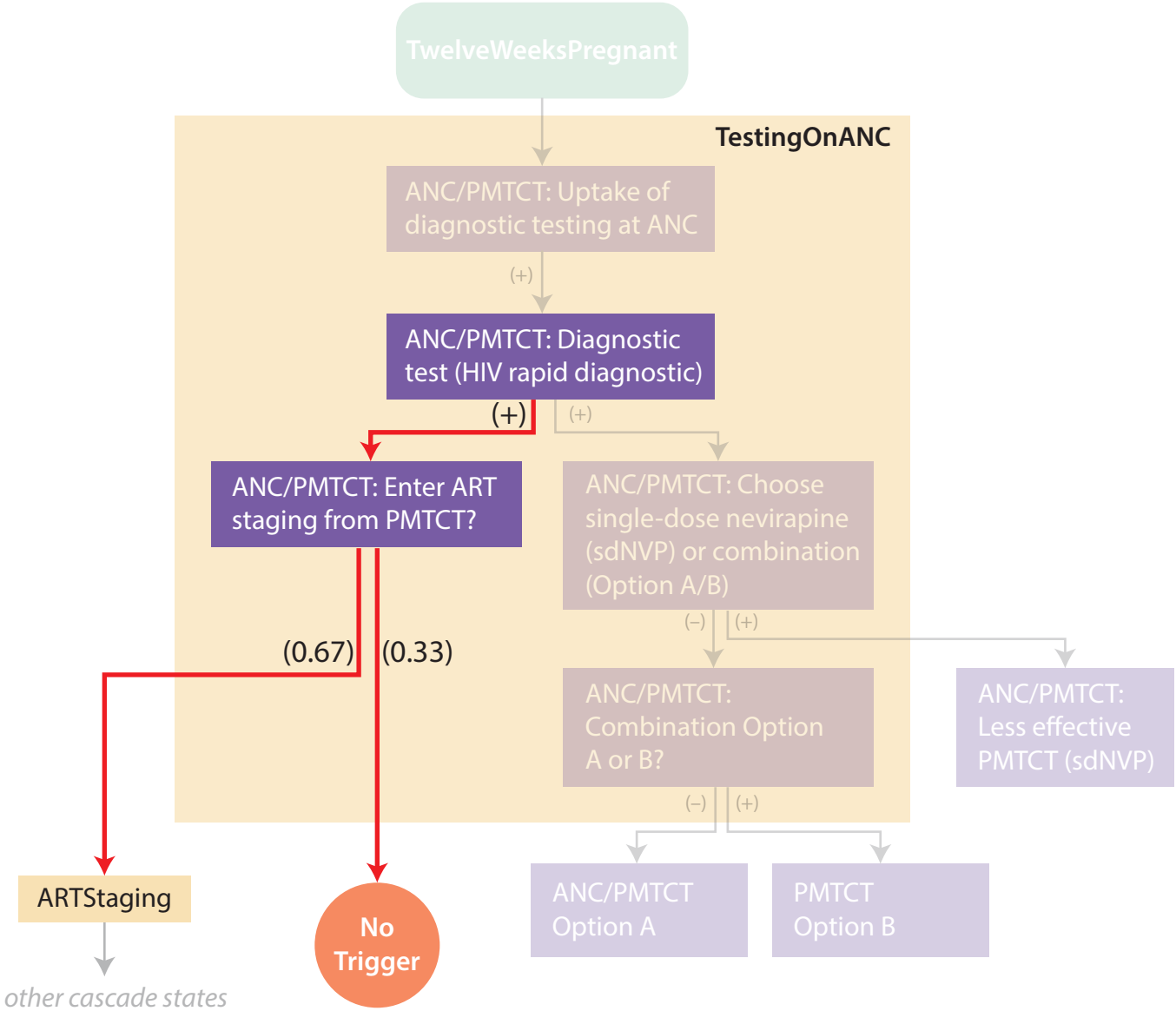
ANC/PMTCT: Combination Option A or B?
ANC/PMTCT: Less effective PMTCT (sdNVP)
(–)
(+)
ARTStaging
other cascade states
No Trigger
ANC/PMTCT Option A
PMTCT Option B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(0.33)
(–)
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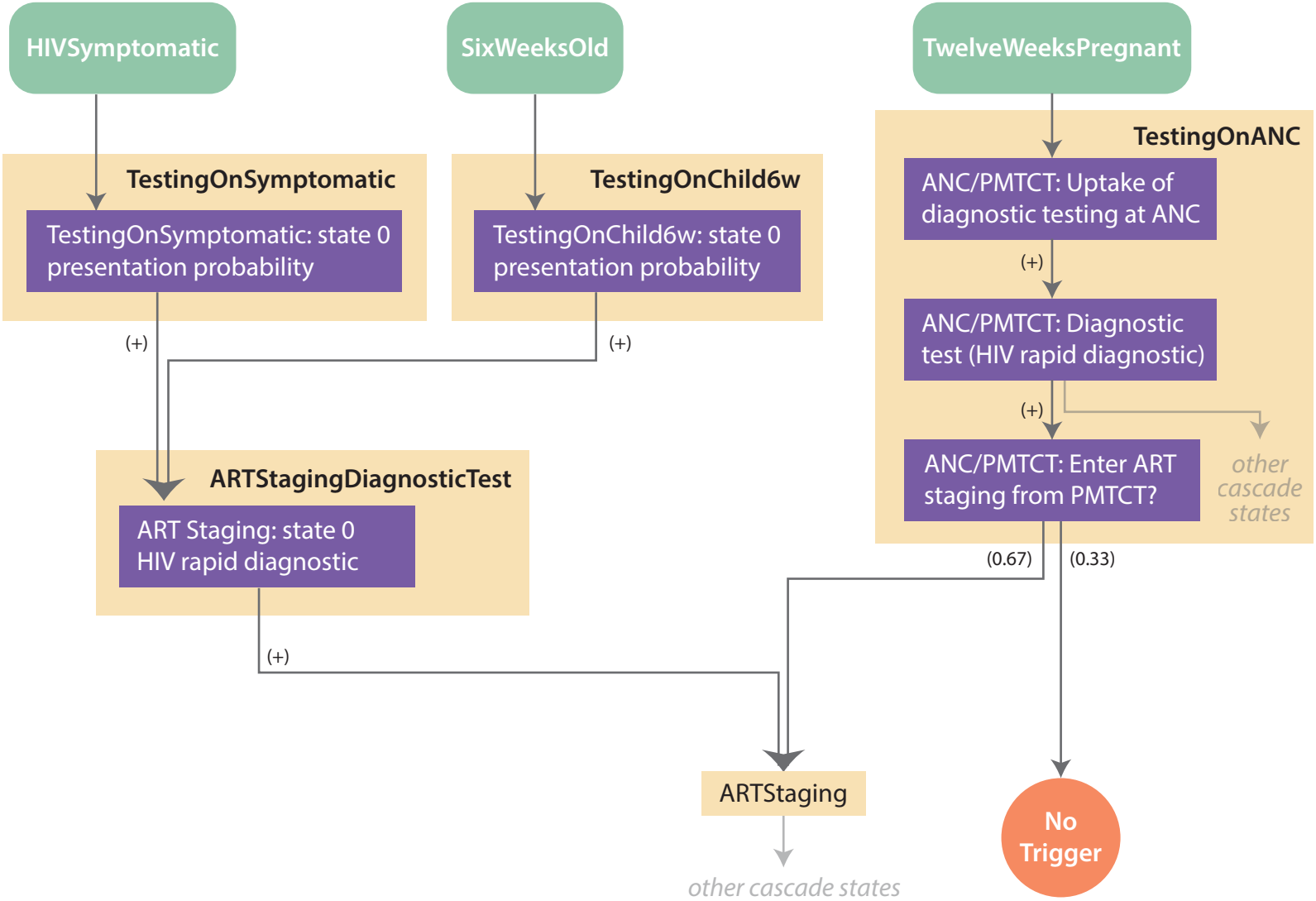
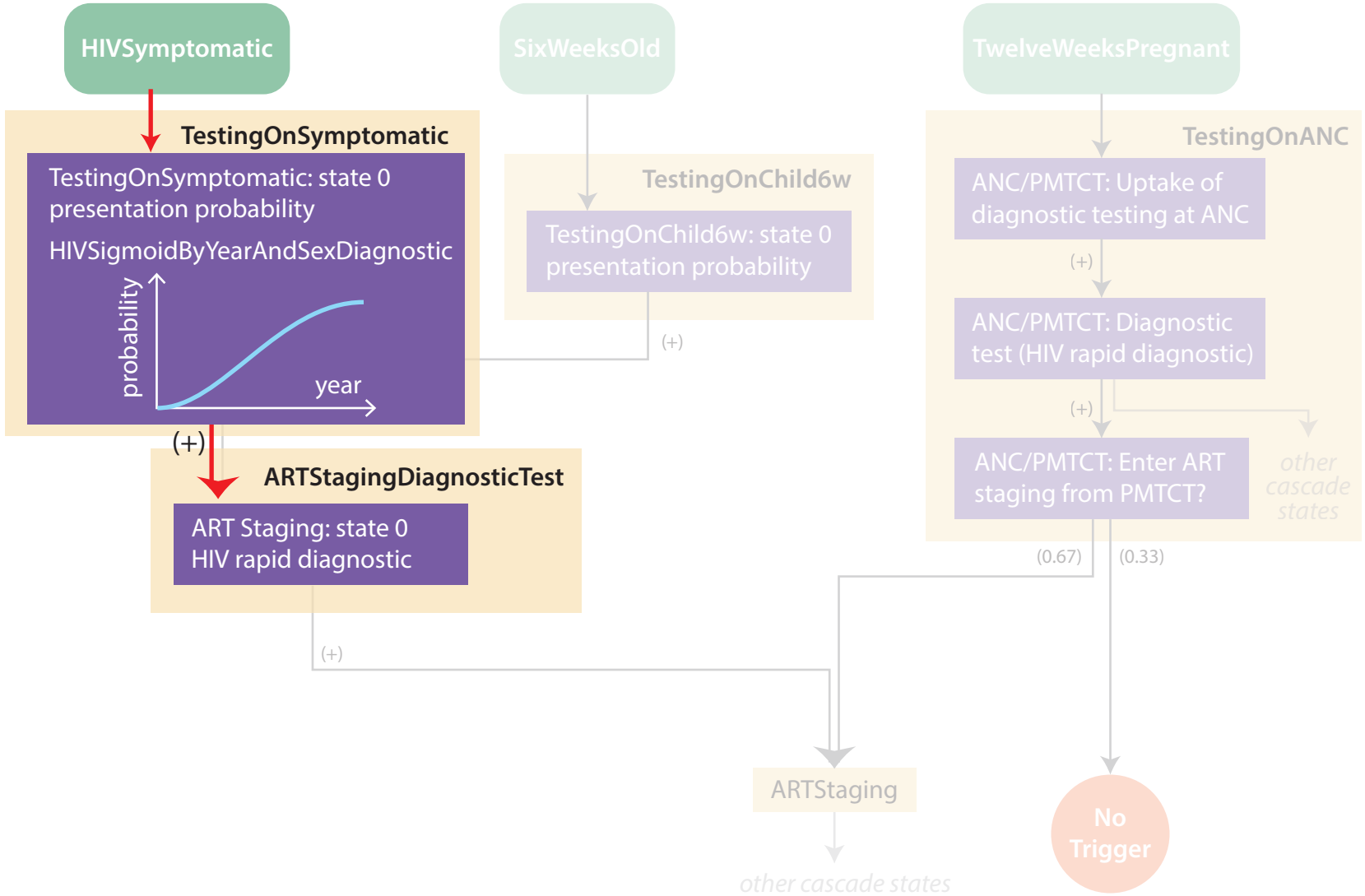
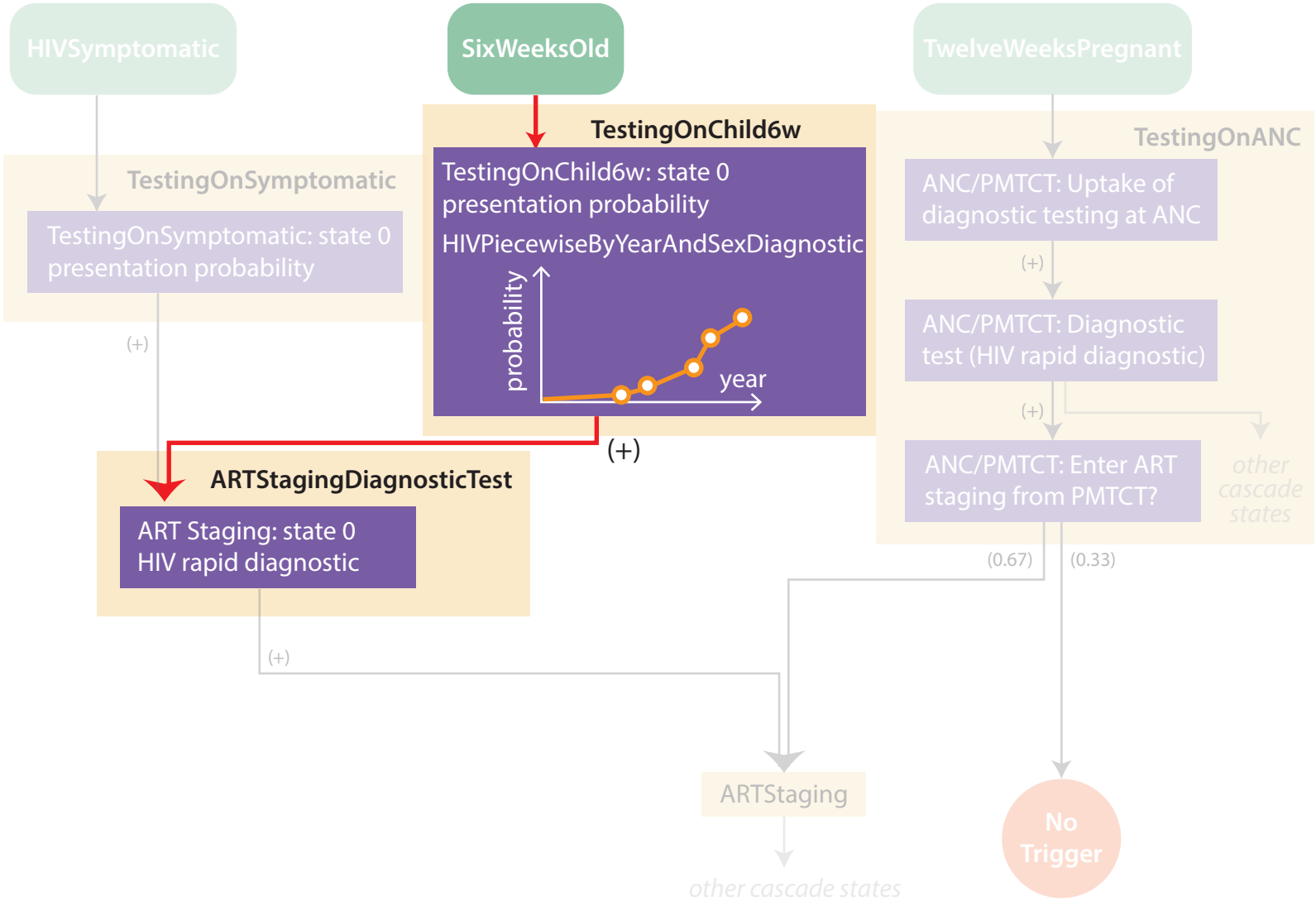
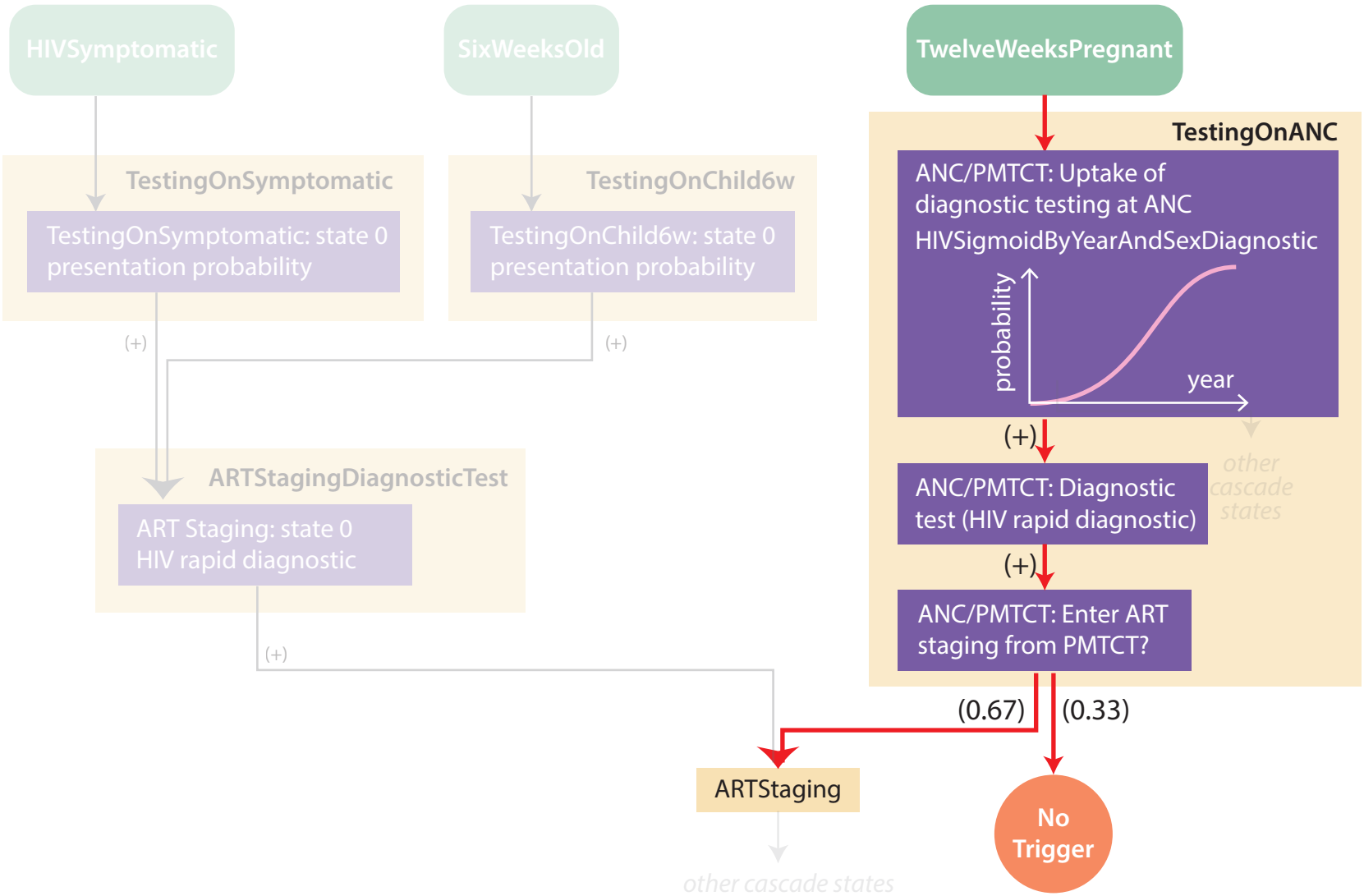
ANC/PMTCT: Less effective PMTCT (sdNVP)
(–)
(+)
ARTStaging
other cascade states
No Trigger
ANC/PMTCT Option A
PMTCT Option B


HIVSymptomatic
SixWeeksOld
TwelveWeeksPregnant
TestingOnSymptomatic
TestingOnSymptomatic: state 0 presentation probability
TestingOnChild6w
TestingOnChild6w: state 0 presentation probability
TestingOnANC
ANC/PMTCT: Uptake of diagnostic testing at ANC
(+)
ANC/PMTCT: Diagnostic test (HIV rapid diagnostic)
(+)
ANC/PMTCT: Enter ART staging from PMTCT?
other cascade states
(+)
(+)
ARTStagingDiagnosticTest
ART Staging: state 0 HIV rapid diagnostic
(0.67)
(0.33)
(+)
ARTStaging
other cascade states
No Trigger


HIVSymptomatic
SixWeeksOld
TwelveWeeksPregnant
TestingOnSymptomatic
TestingOnSymptomatic: state 0 presentation probability
HIVSigmoidByYearAndSexDiagnostic
probability
year
(+)
TestingOnChild6w
TestingOnChild6w: state 0 presentation probability
(+)
TestingOnANC
ANC/PMTCT: Uptake of diagnostic testing at ANC
(+)
ANC/PMTCT: Diagnostic test (HIV rapid diagnostic)
(+)
ANC/PMTCT: Enter ART staging from PMTCT?
other cascade states
(0.67)
(0.33)
(+)
ARTStagingDiagnosticTest
ART Staging: state 0 HIV rapid diagnostic
ARTStaging
other cascade states
No Trigger


HIVSymptomatic
SixWeeksOld
TwelveWeeksPregnant
TestingOnChild6w
TestingOnSymptomatic
TestingOnSymptomatic: state 0 presentation probability
TestingOnChild6w: state 0 presentation probability
HIVPiecewiseByYearAndSexDiagnostic
probability
year
TestingOnANC
ANC/PMTCT: Uptake of diagnostic testing at ANC
(+)
ANC/PMTCT: Diagnostic test (HIV rapid diagnostic)
(+)
ANC/PMTCT: Enter ART staging from PMTCT?
other cascade states
(+)
(+)
ARTStagingDiagnosticTest
ART Staging: state 0 HIV rapid diagnostic
(0.67)
(0.33)
(+)
ARTStaging
other cascade states
No Trigger


HIVSymptomatic
SixWeeksOld
TwelveWeeksPregnant
TestingOnSymptomatic
TestingOnSymptomatic: state 0 presentation probability
TestingOnChild6w
TestingOnChild6w: state 0 presentation probability
TestingOnANC
ANC/PMTCT: Uptake of diagnostic testing at ANC
HIVSigmoidByYearAndSexDiagnostic
probability
year
(+)
ANC/PMTCT: Diagnostic test (HIV rapid diagnostic)
other cascade states
(+)
ANC/PMTCT: Enter ART staging from PMTCT?
(+)
(+)
ARTStagingDiagnosticTest
ART Staging: state 0 HIV rapid diagnostic
(+)
(0.67)
(0.33)
ARTStaging
No Trigger
other cascade states