TABLE 3: MEDICAL CARE SERVICES FOR PEOPLE LIVING WITH HIV (PLWH)

(green: parameters that can be modified by users) (blue: dynamic formula) (purple: dynamic outcomes exported to other module[s])

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Engagement in HIV Medical Care				
Newly diagnosed initial clinic scheduling rate	flow	Persons/ month	HIV TESTING AND PREVENTION SERVICES.Newly diagnosed persons referred for initial clinic appt {UNIFLOW}	Monthly rate of newly diagnosed people living with HIV (PLWH) entering the medical care system by being linked to care for the first time after diagnosis. This rate is being generated in and is imported from the "HIV Prevention and Testing Services" module.
HIV Patients scheduled for initial clinical visit	stock	Persons	HIV Patients scheduled for initial clinical visit(t - dt) + (Newly diagnosed initial clinic scheduling rate - Linked to care rate - Mortality Rate of HIV Patients pending initial clinical visit) * dt {NON-NEGATIVE} **Initial value** = 0	The number over time of newly diagnosed HIV patients who are scheduled for their initial medical HIV appointment waiting to be "linked to care."
Mortality Rate of HIV Patients pending initial clinical visit	flow	Persons/ month	HIV Patients scheduled for initial clinical visit * HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month {UNIFLOW}	Monthly rate of HIV patients not yet linked to HIV medical care who die of any cause before being linked to care for their HIV disease, using the CT DPH HIV Surveillance rate of HIV deaths per month.[1] This mortality rate is being generated in and imported from the "HIV Infection and Treatment as Prevention" module.
Avg time to first clinical visit	auxiliary	Month	2	Stakeholder-estimated[a] time it typically takes for a newly diagnosed PLWH who is scheduled for an initial medical appointment to have that appointment and officially be "linked to care." CT DPH 2017 continuum of care report for the Hartford TGA indicated 86% of newly diagnosed were linked to care in <=1 mo; 94% in <=3 months, 96% in <=6 months and 97% in <=12 months.[1]
Linked to care rate	flow	Persons/ month	(HIV Patients scheduled for initial clinical visit * RYAN WHITE CASE MANAGEMENT SERVICES.Effect of UNMET NEED FOR CM on Linked to Care rate) / Avg time to first clinical visit {UNIFLOW}	Monthly rate at which newly diagnosed PLWH who are scheduled for an initial medical appointment for HIV care become linked to care. This transition can only occur once. After being "linked to care" the first time, a PLWH can never return to the status of being "unlinked," even if becoming "lost to care" by dropping out of medical care. This rate may be affected by unmet need for case management, the effects of which are being imported from the "Ryan White Case Management Services" module.
HIV Patients scheduled for followup clinical visit	stock	Persons	HIV Patients scheduled for followup clinical visit(t - dt) + (Rate of HIV patients scheduled for subsequent clinical visit + Linked to care rate + Lost to care returning rate + No show reschedule rate - HIV patient clinical visit rate - No show rate - Patients scheduled for followup visit mortality rate) * dt {NON-NEGATIVE} **Initial value = (**Init DIAGNOSED PLWH * Init prop ENGAGED IN CARE)	Number of PLWH over time who recently attended a clinical appointment for HIV care who are scheduled for the next one. The components of the formula for the initial value of this stock is imported from the "HIV Infection and Treatment as Prevention" module.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Patients scheduled for followup visit mortality rate	flow	Persons/ month	HIV Patients scheduled for followup clinical visit * HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month {UNIFLOW}	Monthly rate of HIV patients who are engaged in HIV medical care and scheduled for a follow-up appointment who die of any cause, using the CT DPH HIV Surveillance rate of HIV deaths per month.[1] This mortality rate is being generated in and imported from the "HIV Infection and Treatment as Prevention" module.
Visits per patient	auxiliary	1/Month	1	Per-patient number of visits per month to medical care.
Prop of HIV patients completing scheduled clinical visits	auxiliary	dmnl	0.75	Stakeholder-estimated[a] proportion of PLWH who complete their scheduled clinical appointments and are rescheduled for a follow-up appointment, based on clinical experiences.
Maximum HIV clinical visit capacity per month	auxiliary	Persons/ Month	1000	Stakeholder-estimated[a] number of available PLWH appointment slots per month with a medical provider with prescribing privileges (MD, DO, PA, APRN, etc.) in the catchment area (Hartford TGA—Hartford, Middlesex and Tolland Counties, CT). This max places a limit on the system in terms of both available appointments for PLWH and available slots for those who miss appointments.
HIV patient clinical visit rate	flow	Persons/ month	IF(HIV Patients scheduled for followup clinical visit * Prop of HIV patients completing scheduled clinical visits * Visits per patient) < Maximum HIV clinical visit capacity per month THEN (HIV Patients scheduled for followup clinical visit * Prop of HIV patients completing scheduled clinical visits * Visits per patient) ELSE (Maximum HIV clinical visit capacity per month) {UNIFLOW}	Monthly rate at which HIV patients who have been scheduled for a medical appointment see their provider to complete their appointment. This rate is limited by the maximum number of clinical appointments available in the catchment area.
HIV Patients who recently completed a followup clinical visit	stock	Persons	HIV Patients who recently completed a followup clinical visit(t - dt) + (HIV patient clinical visit rate - Rate of HIV patients scheduled for subsequent clinical visit - Patients recently completing visit mortality rate) * dt {NON-NEGATIVE} **Initial value** = 0	Number of HIV patients over time who complete their medical appointments. Patients briefly enter the status of just having completed a clinical visit before again becoming patients scheduled for their followup clinical visit simultaneous with their visit or shortly thereafter.
Patients recently completing visit mortality rate	flow	Persons/ month	HIV Patients who recently completed a followup clinical visit * HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month {UNIFLOW}	Monthly rate at which PLWH who just completed a routine medical appointment for HIV care die of any cause, using the CT DPH HIV Surveillance rate of HIV deaths per month.[1] This mortality rate is imported from the "HIV Infection and Treatment as Prevention" module.
Time to be rescheduled for next clinical visit	auxiliary	Months	0.25	Time needed after completing a medical appointment to be scheduled for the next appointment. Followup appointments are general scheduled simultaneously with the clinical visit.
Rate of HIV patients scheduled for subsequent clinical visit	flow	Persons/ month	HIV Patients who recently completed a followup clinical visit / Time to be rescheduled for next clinical visit {UNIFLOW}	Monthly rate of PLWH who have completed a medical appointment to be scheduled for their next appointment.
PLWH Engaged in Care	auxiliary	Persons	HIV Patients scheduled for followup clinical visit + HIV Patients who recently completed a followup clinical visit + No shows pending followup visit	Sum of all PLWH who are engaged in care, including those pending and just completing a medical appointment, and those who missed an appointment and are being rescheduled (but are within 12 months of their prior medical visit).

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Missed HIV Medical Care Appointments and Rescheduling				
Prop PLWH with dependable transportation	auxiliary	dmnl	0.6	Stakeholder-estimated[a] proportion of HIV patients who have dependable transportation to medical appointments (with or without transportation assistance), based on case management experience with clients.
Effect of transportation on prop of no shows	auxiliary	dmnl	GRAPH(Prop PLWH with dependable transportation) (0.000, 0.950), (1.000, 0.050)	Graphical function of the effect of dependable transportation on the rate of PLWH no shows to their medical appointments. This is a linear relationship whereby the lowest proportion with dependable transportation (0.000) is associated with the highest effect on the proportion of no shows (0.950), and highest proportion with dependable transportation (1.000) is associated with the lowest effect on the proportion of no shows (0.050). The effect variable is a multiplier on the no show rate (See **Fig. 3.1** below.)
Avg time to no show	auxiliary	Months	6	Average time between previous appointment and scheduled appointment to which the PLWH was a no show
No show rate	flow	Persons/ month	(HIV Patients scheduled for followup clinical visit * Effect of transportation on prop of no shows * Total Effect of Basic Svcs and Action Strategies * Visits per patient) / Avg time to no show {UNIFLOW}	Monthly rate at which HIV patients miss their clinical appointment for HIV medical care for any reason. The effects of dependable transportation and the "Total Effect of Basic Svcs (services) and Action Strategies" (see below) are included in the formula to determine this rate.
No shows pending followup visit	stock	Persons	No shows pending followup visit(t - dt) + (No show rate - Lost to care rate - No show reschedule rate - No Shows mortality rate) * dt {NON-NEGATIVE} **Initial value** = No show rate * Avg time to reschedule no show	The number of HIV patients over time who missed their medical appointments and are waiting to receive a rescheduled medical appointment.
No Shows mortality rate	flow	Persons/ month	No shows pending followup visit * HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month {UNIFLOW}	Monthly rate at which PLWH who missed a medical appointment for HIV and are awaiting a rescheduled appointment die of any cause, using the CT DPH HIV Surveillance rate of HIV deaths per month.[1] This mortality rate is imported from the "HIV Infection and Treatment as Prevention" module.
Avg time to reschedule no show	auxiliary	Month	1	Stakeholder-estimated[a] average time for an HIV patient who missed a medical appointment to be reschedule for a replacement appointment, based on clinical experience.
No show reschedule rate	flow	Persons/ month	No shows pending followup visit / Avg time to reschedule no show {UNIFLOW}	Monthly rate at which HIV patients who missed a medical appointment are rescheduled for another with their medical provider.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Lost to HIV Medical Care				
Avg time to become lost to care	auxiliary	Months	12	Time it takes for an HIV patient to be defined as lost to HIV medical care, based on CT Dept. of Health (DPH) national reporting protocol for defining engagement in care as having a CD4 and VL count within the prior 12 month reporting period. (This model handles all PLWH who had a medical appointment between 6 and 12 months of their previous appointment but did not attend as no shows.)
Initial Prop of No Shows Lost to Care	auxiliary	dmnl	0.6	Stakeholder-estimated[a] proportion of HIV patients who are "lost to care" by HRSA definition or medical provider protocols. The stakeholder modeling group set this initial proportion to equal the proportion of people in the catchment area (Hartford TGA) reported by CT DPH HIV treatment cascade as not "engaged in care" (defined as having seen a medical provider at least once in a 12-month reporting period).[1] Note: Affirming uncertainty in the true value of this parameter, sensitivity to changes in the "proportion of virally suppressed of diagnosed PLWH" relative to this initial proportion of no shows lost to care parameter was assessed (Range = 0.6 +/- 10%).
Effect of Action Strategies on Risk of being Lost to Care	auxiliary	dmnl	MOBILIZING COMMUNITY INITIATIVES TO SUPPORT PLWH.Effect of family support programs on lost to care rate + MOBILIZING COMMUNITY INITIATIVES TO SUPPORT PLWH.Effect of Community Knowledge of HIV on lost to care rate + MOBILIZING COMMUNITY INITIATIVES TO SUPPORT PLWH.Effect of Medical Mistrust on lost to care rate + MOBILIZING COMMUNITY INITIATIVES TO SUPPORT PLWH.Effect of HIV stigma on lost to care rate + PEER ADVOCACY TO SUPPORT PLWH.Effect of PLWH empowerment on lost to care rate	Sum of all Action Strategy effects from the "Mobilizing Community Initiatives to Support PLWH" module (including effect of family support programs, community knowledge of HIV, medical mistrust, and stigma) and from the "Peer Advocacy to Support PLWH" module (including effect of PLWH empowerment). These effects are being imported from those respective Action Strategy modules, which are activated when those Action Strategies are turned on (see "ON OFF" for each of those modules).
Initial Effect of Action Strategies	auxiliary	persons	INIT(Effect of Action Strategies on Risk of being Lost to Care)	Effect of action strategies at the start of the simulation run. This is used to generate a ratio of change resulting from Action Strategy "what-if" simulations.
Ratio of Current to Initial Effect of Action Strategies on Lost to Care Rate	auxiliary	dmnl	Effect of Action Strategies on Risk of being Lost to Care / Initial Effect of Action Strategies	Indicates the ratio of current to initial effect of Action Strategy inputs on the rate of lost to care in different simulation scenarios.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Effect of Unmet Needs on Risk of being Lost to Care	auxiliary	dmnl	GRAPH(MEAN("HOUSING, SUBSTANCE USE TREATMENT, AND MENTAL HEALTH SERVICES FOR PLWH".Effect of unmet need for HOUSING SERVICES on Lost to Care Rate, "HOUSING, SUBSTANCE USE TREATMENT, AND MENTAL HEALTH SERVICES FOR PLWH".Effect of unmet need for SU TX NEEDS on Lost to Care Rate, "HOUSING, SUBSTANCE USE TREATMENT, AND MENTAL HEALTH SERVICES FOR PLWH".Effect of unmet need for MH CARE NEEDS on Lost to Care Rate, RYAN WHITE CASE MANAGEMENT SERVICES.Effect of UNMET NEED FOR CM on Lost to Care Rate)) (0.000, 0.502), (0.150, 0.510), (0.300, 0.623), (0.450, 1.183), (0.600, 1.408), (0.750, 1.592), (0.900, 1.675), (1.050, 1.758), (1.200, 1.892), (1.350, 1.950), (1.500, 1.984)	This graphic effect function begins with calculating the mean effects of unmet need for housing services, substance use treatment, mental health care, and case management supports. (These unmet need effect variables are imported from the "Housing, Substance Use Treatment, and Mental Health Services" module and the "Ryan White Case Management Services" module, respectively.) The mean is then graphed in relation to the effect of unmet needs on the risk of being lost to care on a non-linear S curve, with lowest mean unmet needs for housing, substance use treatment, mental health care, and case management (0.000) associated with the lowest effect on the lost to care rate (0.502), and highest unmet needs (1.500) associated with highest effect on the lost to care rate (1.984). (Interim points on the S-curve graph are indicated in the formula and in **Fig. 3.2**.) The effect variable is a multiplier on the lost to care rate.
Total Effect of Basic Svcs and Action Strategies	auxiliary	dmnl	Effect of Unmet Needs on Risk of being Lost to Care * Ratio of Current to Initial Effect of Action Strategies on Lost to Care Rate	Multiplies the effects of Basic Services (unmet needs) and Action Strategies (supportive interventions) on the lost to care rate.
Lost to care rate	flow	Persons/ month	(No shows pending followup visit * Initial Prop of No Shows Lost to Care * Total Effect of Basic Svcs and Action Strategies) / Avg time to become lost to care {UNIFLOW}	Monthly rate at which PLWH who have been linked to care (that is, had at least one appointment with a medical provider with prescribing privileges to initiate their HIV medical care) become "lost to care," defined as having no CD4/VL counts reported to CT DPH within the 12 month reporting period.[1]
HIV Patients Lost to care	stock	Persons	HIV Patients Lost to care(t - dt) + (Lost to care rate - Patients lost to care mortality rate - Lost to care returning rate) * dt {NON-NEGATIVE} **Initial value** = HIV INFECTION AND TREATMENT AS PREVENTION.Init DIAGNOSED PLWH * HIV INFECTION AND TREATMENT AS PREVENTION.Init prop of DIAGNOSED PLWH LOST TO CARE	Number of PLWH in the catchment area who are lost to care (no CD4/VL count for a 12 month period) over time. The components of the initial value of this stock (Diagnosed PLWH and initial proportion of diagnosed who are lost to care) are being imported from the "HIV Infection and Treatment as Prevention" module.
Patients lost to care mortality rate	flow	Persons/ month	HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month * HIV Patients Lost to care {UNIFLOW}	Monthly rate at which PLWH who are lost to care die of any cause, using the CT DPH HIV Surveillance rate of HIV deaths per month.[1] This mortality rate is imported from the "HIV Infection and Treatment as Prevention" module.
Returning to HIV Medical Care				
Available number of EIS	auxiliary	EIS	2	Full-time equivalent number of Early Intervention Specialists (EIS) in the catchment area who are assigned with finding PLWH who are lost to care (12 or more months not in medical care). (Represents the number of staff funded through Hartford TGA Ryan White Part A funding in 2017.)

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Time needed to hire EIS	auxiliary	Months	12	Stakeholder-estimated[a] time required to hire and train new Early Intervention Specialists (EIS) to engage in finding lost to care PLWH in the catchment area.
Change in available EIS	flow	EIS/Month	(Available number of EIS - Early Intervention Specialists) / Time needed to hire EIS	Monthly rate at which employees become EIS to find PLWH who are lost to care.
Early Intervention Specialists	stock	EIS	Early Intervention Specialists(t - dt) + (Change in available EIS) * dt {NON-NEGATIVE} **Initial value** = 3	Number of Early Intervention Specialists (EIS) over time who are available in the catchment area to seek PLWH who are lost to medical care.
Initial Lost to Care	auxiliary	persons	INIT(HIV Patients Lost to care)	HIV patients lost to care at the start of the simulation run. This is used to generate a ratio of change in the number of PLWH lost to care resulting from the effectiveness of EIS to find them in simulations.
EIS worker effectiveness	auxiliary	dmnl	GRAPH(HIV Patients Lost to care / Initial Lost to Care) (0.000, 0.000), (0.100, 0.065), (0.200, 0.700), (0.300, 0.814), (0.400, 0.858), (0.500, 0.887), (0.600, 0.923), (0.700, 0.943), (0.800, 0.951), (0.900, 0.972), (1.000, 1.000)	Graphic function of the effectiveness of EIS to find lost to care PLWH over time during simulations. EIS effectiveness is graphed in relation to the number of PLWH who are lost to care on a non-linear S curve, with lowest EIS effectiveness (0.000) associated with lowest number of PLWH lost to care (0.000), and highest EIS effectiveness (1.000) associated with largest proportion of PLWH lost to care (1.000). (Interim points on the S-curve graph are indicated in the formula and in **Fig. 3.3**)
Patients per EIS worker returning to care	auxiliary	Patients/ month/ person	8	Number of lost to care PLWH cases an Early Intervention Specialist can manage (seek) per month.
Number of patients potentially returning to Care	auxiliary	Patients/ month	Early Intervention Specialists * Patients per EIS worker returning to care * EIS worker effectiveness	Total effects of the number of EIS, their caseload of PLWH lost to care, and their effectiveness to bring them back to care.
Avg time for lost to care to return to care	auxiliary	Months	1	Stakeholder-estimated[a] time it takes for a lost to care PLWH to return to medical care, with or without the assistance of EIS.
Lost to care returning rate	flow	Persons/ month	(Number of patients potentially returning to Care / Total Effect of Basic Svcs and Action Strategies) / Avg time for lost to care to return to care {UNIFLOW}	Monthly rate at which PLWH who were lost to care return to HIV medical care. This is affected by the "Total Effect of Basic Svcs (services) and Action Strategies" variable.

[a] Stakeholder-estimated parameters were set through a deliberative process with a broadly mixed stakeholder community modeling group that represented the spectrum of HIV medical and other care services and PLWH.

1. CT Department of Public Health. Epidemiological Profile of HIV in Connecticut. 2018.

Fig. 3.1 Effect of transportation on prop of no shows

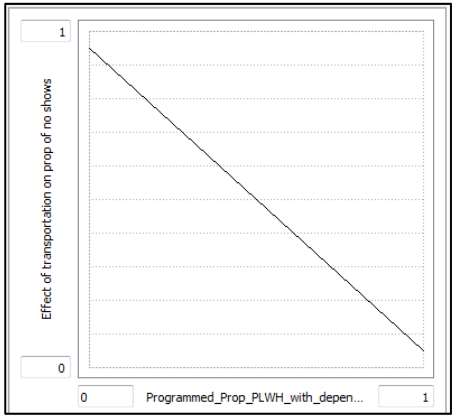

Fig. 3.2 Effect of Unmet Needs on Risk of being Lost to Care

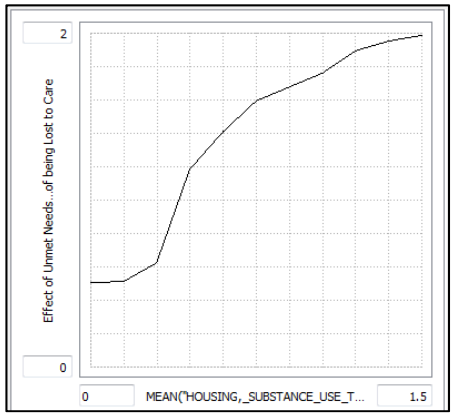

Fig. 3.3 EIS worker effectiveness