TABLE 5: HOUSING, SUBSTANCE USE TREATMENT, AND MENTAL HEALTH SERVICES FOR 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
Housing Services Resources and Capacity				
Total ANNUAL HOUSING SUPPORT FUNDS	auxiliary	Dollars/ Year	2100000	Total special funds designated for housing support for PLWH, including Ryan White Part A and HOPWA funding in the catchment area (Hartford TGA: Hartford, Middlesex, and Tolland Counties, CT).
Average HOUSING SUPPORT per client per month	auxiliary	Dollars/ Payment/ Month	750	Stakeholder-estimated[a] limit on monthly housing support payments per PLWH needing housing support. This figure is supported by Ryan White Part A documentation of planned and actual dollars spent on funded housing service types for the years 2015 – 2018.
Avg Number of HOUSING SUPPORT payments received per year	auxiliary	Payments/ Year	12	Expected housing support for all months in every year housing support is needed.
Capacity for Housing support each month	auxiliary	persons	(Total ANNUAL HOUSING SUPPORT FUNDS / Average HOUSING SUPPORT per client per month) / Avg Number of HOUSING SUPPORT payments received per year	Combination of total housing support funds plus any additional funds divided by the amount per payment and the number of payments per year per PLWH.
Capacity Effect on Initiating Housing Support	auxiliary		GRAPH((Capacity for Housing support each month-PLWH receiving HOUSING SUPPORT) / Capacity for Housing support each month) (0.000, 0.000), (0.01, 0.013), (0.02, 0.132), (0.03, 0.404), (0.04, 0.800), (0.05, 0.864), (0.06, 0.928), (0.07, 0.962), (0.08, 0.983), (0.09, 0.991), (0.1, 0.992)	Graphic function of the effect of housing resource capacity on PLWH initiating receiving housing support funds over time during simulations. Capacity effect is graphed in relation to the capacity for housing support on a non-linear S curve, with lowest housing support capacity (0.000) associated with lowest capacity effect (0.000), and highest housing capacity (0.1) associated with highest capacity effect (0.992). (Interim points on the S-curve graph are indicated in the formula and in **Fig. 5.1**.) The Capacity Effect variable is a multiplier with the rate of PLWH initiating housing support.
Expected client HOUSING SUPPORT wait time	auxiliary	Month	2	Stakeholder-estimated[a] wait time for PLWH to receive housing support in the catchment area after initiating a request based on case management experiences.
Housing Services Utilization				
Estimated prop of PLWH who are HOUSING UNSTABLE at diagnosis	auxiliary	dmnl	.30	Stakeholder-estimated[a] proportion of PLWH who have housing support needs at diagnosis, based on HIV testing and medical case management provider experiences.
Rate of PLWH Not Initially Needing Housing support	flow	persons/ month	HIV TESTING AND PREVENTION SERVICES.Total HIV positive tests per month * (1 - Estimated prop of PLWH who are HOUSING UNSTABLE at diagnosis) {UNIFLOW}	Monthly rate of newly infected PLWH joining the stock of those who do not have housing needs. The rate of newly infected is being imported from the "HIV Testing and Prevention" module.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
PLWH Not Requiring HOUSING SUPPORT at Diagnosis	stock	Persons	PLWH Not Requiring HOUSING SUPPORT at Diagnosis(t - dt) + (Rate of PLWH Not Initially Needing Housing support - Rate of PLWH Later Requiring Housing support - Mortality of People with Stable Housing) * dt **Initial value** = 2000	Number of PLWH who do not have need for housing support beginning at diagnosis and continuing over time.
Mortality of People with Stable Housing	flow	persons/ month	PLWH Not Requiring HOUSING SUPPORT at Diagnosis * HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month {UNIFLOW}	Monthly rate at which PLWH who do not have housing support needs 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.
Prop of stably housed PLWH later developing Housing Needs	auxiliary	dmnl	.05	Stakeholder-estimated[a] proportion of PLWH who do not have housing support needs at diagnosis become housing unstable and need supports later on.
Time to develop Housing Needs later	auxiliary	Months	48	Stakeholder-estimated[a] time it takes for PLWH who do not have need for housing support to develop housing support needs later on.
Rate of PLWH Later Requiring Housing support	flow	persons/ month	PLWH Not Requiring HOUSING SUPPORT at Diagnosis * Prop of stably housed PLWH later developing Housing Needs / Time to develop Housing Needs later {UNIFLOW}	Monthly rate at which PLWH who did not have housing support needs develop them later on and are pending receiving housing supports.
Rate of PLWH seeking housing support	flow	Persons /month	HIV TESTING AND PREVENTION SERVICES.Total HIV positive tests per month * Estimated prop of PLWH who are HOUSING UNSTABLE at diagnosis {UNIFLOW}	Monthly rate at which PLWH are identified at diagnosis as needing housing supports.
PLWH needing and pending HOUSING SUPPORT	stock	Persons	PLWH needing and pending HOUSING SUPPORT(t - dt) + (Rate of PLWH seeking housing support + Rate of PLWH with Recurrent Need for Housing Support + Rate of PLWH Later Requiring Housing support - Rate of PLWH initiating housing support - Mortality of PLWH while awaiting Housing Support) * dt {NON-NEGATIVE} **Initial value** = 20	Number of PLWH over time who are housing unstable and need housing support services and funding. This includes those who need housing supports at HIV diagnosis and those who did not but developed housing needs later on.
Mortality of PLWH while awaiting Housing Support	flow	persons/ month	PLWH needing and pending HOUSING SUPPORT * HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month {UNIFLOW}	Monthly rate of PLWH awaiting housing support 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.
Rate of PLWH initiating housing support	flow	persons/ month	(PLWH needing and pending HOUSING SUPPORT / Expected client HOUSING SUPPORT wait time) * Capacity Effect on Initiating Housing Support {UNIFLOW}	Monthly rate of PLWH with housing support needs initiating their housing support, based on housing resource capacity.
PLWH receiving HOUSING SUPPORT	stock	Persons	PLWH receiving HOUSING SUPPORT(t - dt) + (Rate of PLWH initiating housing support - Rate of PLWH with Short Term Need No Longer Needing housing support - Rate of PLWH with Long Term Need No Longer Needing housing support - Mortality of PLWH receiving housing support) * dt {NON-NEGATIVE} **Initial value** = 275	Number of PLWH with housing support needs who are receiving housing supports over time.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Mortality of PLWH receiving housing support	flow	persons/ month	PLWH receiving HOUSING SUPPORT * HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month {UNIFLOW}	Monthly rate of PLWH who are receiving housing support 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.
Prop of PLWH with Housing Needs whose needs are long term	auxiliary	dmnl	.6	Stakeholder-estimated[a] proportion of all PLWH with housing needs who need long-term housing support, such as permanent subsidies or housing unit. This estimate is based on medical and housing case management experiences.
Time to become housing stable after long term need	auxiliary	Months	120	Stakeholder-estimated[a] time needed for a PLWH who needs long-term housing support to become housing stable in the catchment area.
Rate of PLWH with Long Term Need No Longer Needing housing support	flow	persons/ month	PLWH receiving HOUSING SUPPORT * Prop of PLWH with Housing Needs whose needs are long term / Time to become housing stable after long term need {UNIFLOW}	Monthly rate at which PLWH who have long-term housing needs become housing stable and no longer need housing supports.
Time to become housing stable after short term need	auxiliary	Months	12	Stakeholder-estimated[a] time needed for a PLWH who needs short-term housing support to become housing stable in the catchment area, based on case management experience.
Rate of PLWH with Short Term Need No Longer Needing housing support	flow	persons/ month	PLWH receiving HOUSING SUPPORT * (1 - Prop of PLWH with Housing Needs whose needs are long term) / Time to become housing stable after short term need {UNIFLOW}	Monthly rate at which PLWH who have short-term housing needs become housing stable and no longer need housing supports.
PLWH Formerly Receiving HOUSING SUPPORT	stock	Persons	PLWH Formerly Receiving HOUSING SUPPORT(t - dt) + (Rate of PLWH with Short Term Need No Longer Needing housing support + Rate of PLWH with Long Term Need No Longer Needing housing support - Rate of PLWH with Recurrent Need for Housing Support - Mortality of PLWH formerly receiving housing support) * dt **Initial value** = 1000	Number of PLWH over time who received housing supports for PLWH but no longer need them and are housing stable.
Mortality of PLWH formerly receiving housing support	flow	persons/ month	HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month * PLWH Formerly Receiving HOUSING SUPPORT {UNIFLOW}	Monthly rate of PLWH who are housing stable (no longer receiving housing support) 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.
Prop of PLWH with Recurrent Housing Need	auxiliary	dmnl	.2	Stakeholder-estimated[a] proportion of housing stable PLWH who were former housing support recipients who re-develop housing support needs of any kind; estimate based on medical and housing case management experiences.
Time for recurrent Housing Need to develop	auxiliary	months	36	Stakeholder-estimated[a] time needed for a former housing support recipient to need housing support again, based on case management experience.
Rate of PLWH with Recurrent Need for Housing Support	flow	persons/ month	PLWH Formerly Receiving HOUSING SUPPORT * Prop of PLWH with Recurrent Housing Need / Time for recurrent Housing Need to develop {UNIFLOW}	Monthly rate at which former housing support recipient PLWH become unstably housed and develop the need again for housing supports.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Unmet Housing Services Need and Effects				
Prop UNMET NEED for HOUSING SUPPORT	auxiliary	dmnl	PLWH needing and pending HOUSING SUPPORT / (PLWH receiving HOUSING SUPPORT + PLWH needing and pending HOUSING SUPPORT)	Model-generated proportion of PLWH who need housing support over all PLWH receiving and needing housing supports, defined as unmet housing service needs.
Effect of unmet need for HOUSING SERVICES on Lost to Care Rate	auxiliary	dmnl	GRAPH(Prop UNMET NEED for HOUSING SUPPORT) (0.000, 0.000), (0.071, 0.050), (0.143, 0.283), (0.214, 0.658), (0.286, 1.000), (0.357, 1.383), (0.429, 1.567), (0.500, 1.675), (0.571, 1.767), (0.643, 1.833), (0.714, 1.917), (0.786, 1.950), (0.857, 1.983), (0.929, 1.992), (1.000, 2.000)	This is a graphic function of the relationship between unmet need for housing services and the proportion of unmet need for housing support. This relationship follows a non-linear S-curve, with lowest proportion unmet needs for housing support (0.000) associated with the lowest effect of unmet housing needs (0.000), and highest lowest proportion unmet needs for housing support (1.000) associated with highest effect of unmet housing needs (2.000). (Interim points on the S-curve graph are indicated in the formula and in **Fig. 5.2**.) This variable is exported to the "Medical Care Services" module as a contributor to the "Effect of Unmet Needs on Risk of being Lost to Care" variable, which is a multiplier in both the no show rate and the lost to care rate.
Substance Use (SU) Treatment (TX) Resources and Capacity				
Max Number of SU TX clients	auxiliary	Person	2000	Stakeholder-estimated[a] number of substance use treatment (SU TX) slots available to treat PLWH in the catchment area. Because there is no way to substantiate this number given the array of treatment types (evidence-based, medication assisted treatment, abstinence only, in-/out-patient, etc.) available to the total population in the catchment area, this figure represents a stakeholder consensus best estimate.
Capacity Effect on New SU TX Patients	auxiliary		GRAPH((Max Number of SU TX clients-PLWH receiving SUBSTANCE USE TREATMENT) / Max Number of SU TX clients) (0.000, 0.000), (0.01, 0.047), (0.02, 0.315), (0.03, 0.549), (0.04, 0.651), (0.05, 0.787), (0.06, 0.894), (0.07, 0.953), (0.08, 0.966), (0.09, 0.991), (0.100, 1.000)	Graphic function of the effect of substance use treatment (SU TX) capacity on PLWH initiating substance use treatment over time during simulations. Capacity effect is graphed in relation to the rate of PLWH initiating substance use treatment on a non-linear S curve, with lowest substance use treatment capacity (0.000) associated with the lowest capacity effect (0.000), and highest treatment capacity (0.100) associated with highest capacity effect (1.000). (Interim points on the S-curve graph are indicated in the formula and in **Fig. 5.3**.) Capacity effect is a multiplier in the rate of PLWH beginning substance use treatment.
Expected PLWH wait time for SU TX	auxiliary	Month	.5	Stakeholder-estimated[a] wait time for PLWH to be able to access substance use treatment in the catchment area after initiating a request, based on case management experiences.
Substance Use (SU) Treatment (TX) Services Utilization				
Estimated prop of PLWH who have SU TX NEEDS at diagnosis	auxiliary	dmnl	.30	Stakeholder-estimated[a] proportion of PLWH who have substance use treatment needs at diagnosis, based on case management experiences.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Rate of Newly Diagnosed PLWH Initially Without SU TX Needs	flow	Person/ Month	HIV TESTING AND PREVENTION SERVICES.Total HIV positive tests per month * (1 - Estimated prop of PLWH who have SU TX NEEDS at diagnosis) {UNIFLOW}	Monthly rate of newly infected PLWH joining the stock of those who do not have substance use treatment needs. The rate of newly infected is being imported from the "HIV Testing and Prevention" module.
PLWH Without SU TX Needs When Initially Diagnosed	stock	Persons	PLWH Without SU TX Needs When Initially Diagnosed(t - dt) + (Rate of Newly Diagnosed PLWH Initially Without SU TX Needs - Rate of PLWH Later Developing SU TX Needs - Mortality of PLWH Without Initial SU TX Needs) * dt **Initial value** = 1500	Number of PLWH who do not have need for substance use treatment over time.
Mortality of PLWH Without Initial SU TX Needs	flow	Person/ Month	HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month * PLWH Without SU TX Needs When Initially Diagnosed {UNIFLOW}	Monthly rate at which PLWH who do not have substance use treatment needs 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.
Prop of PLWH Later Developing SU TX Needs	auxiliary	dmnl	.05	Stakeholder-estimated[a] proportion of PLWH who do not have substance use treatment needs at intake developing substance use disorders and needing treatment later on.
Time to Later Develop SU TX Needs	auxiliary	Months	24	Stakeholder-estimated[a] time it takes for PLWH who do not have substance use disorder at diagnosis to develop it and need substance use treatment later on.
Rate of PLWH Later Developing SU TX Needs	flow	Person/ Month	PLWH Without SU TX Needs When Initially Diagnosed * Prop of PLWH Later Developing SU TX Needs / Time to Later Develop SU TX Needs {UNIFLOW}	Monthly rate at which PLWH who did not have substance use treatment needs at diagnosis develop them later on and are pending receiving substance use treatment.
Rate of Newly Diagnosed PLWH needing SU TX	flow	Person/ Month	HIV TESTING AND PREVENTION SERVICES.Total HIV positive tests per month * Estimated prop of PLWH who have SU TX NEEDS at diagnosis {UNIFLOW}	Monthly rate at which PLWH who have substance use treatment needs at HIV diagnosis are pending receiving treatment.
PLWH needing SUBSTANCE USE TREATMENT	stock	Persons	PLWH needing SUBSTANCE USE TREATMENT(t - dt) + (Rate of Newly Diagnosed PLWH needing SU TX + Rate of Recurrent SU Problems + Rate of PLWH Later Developing SU TX Needs + Rate of dropout from SU TX before completing - Rate of PLWH beginning SU TX - Mortality of People with Pending SU TX Needs) * dt {NON-NEGATIVE} **Initial value** = 200	Number of PLWH over time who have substance use disorders and need substance use treatment. This includes those who need treatment at HIV diagnosis and those who did not but developed substance use treatment needs later on.
Mortality of People with Pending SU TX Needs	flow	Person/ Month	HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month * PLWH needing SUBSTANCE USE TREATMENT {UNIFLOW}	Monthly rate of PLWH awaiting substance use treatment 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.
Prop of PLWH with SU TX needs who seek treatment	auxiliary	dmnl	.5	Stakeholder-estimated[a] proportion of all PLWH with substance use disorder who seek substance use treatment. This estimate is based on case management experiences.
Rate of PLWH beginning SU TX	flow	Person/ Month	PLWH needing SUBSTANCE USE TREATMENT * Prop of PLWH with SU TX needs who seek treatment * Capacity Effect on New SU TX Patients / Expected PLWH wait time for SU TX {UNIFLOW}	Monthly rate of PLWH with substance use disorder initiating substance use treatment, based on available substance use treatment capacity in the catchment area.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
PLWH receiving SUBSTANCE USE TREATMENT	stock	Persons	PLWH receiving SUBSTANCE USE TREATMENT(t - dt) + (Rate of PLWH beginning SU TX - Rate of Completing SU TX for Chronic Problems - Rate of Completing SU TX for Short Term Problems - Mortality of Patients Receiving SU TX - Rate of dropout from SU TX before completing) * dt {NON-NEGATIVE} **Initial value** = 850	Number of PLWH with substance use disorder who are receiving any form of substance use treatment over time.
Mortality of Patients Receiving SU TX	flow	Person/ Month	HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month * PLWH receiving SUBSTANCE USE TREATMENT {UNIFLOW}	Monthly rate of PLWH receiving substance use treatment 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.
Prop of PLWH with SU TX needs who drop out before completing SU TX	auxiliary	dmnl	.6	Stakeholder-estimated[a] proportion of all PLWH with substance use disorder who need substance use treatment, but drop out before completing the program. This estimate is based on case management and substance use treatment experiences in the catchment area.
Time to drop out before completing SU TX	auxiliary	Months	3	Stakeholder-estimated[a] time in which a PLWH in the catchment area who needs substance use treatment drops out before completing the program, based on case management and substance use treatment experience.
Rate of dropout from SU TX before completing	flow	Person/ Month	(PLWH receiving SUBSTANCE USE TREATMENT * Prop of PLWH with SU TX needs who drop out before completing SU TX) / Time to drop out before completing SU TX {UNIFLOW}	Monthly rate at which PLWH with substance use disorder drop out of substance use treatment before completing the program.
Prop of PLWH with SU TX needs who have chronic SU disorder	auxiliary	dmnl	.2	Stakeholder-estimated[a] proportion of substance using PLWH who have chronic substance use disorder. This estimate is based on medical case management and substance use treatment experiences.
Time to Complete SU TX for PLWH with chronic SU disorders	auxiliary	Months	120	Stakeholder-estimated[a] time needed for a PLWH with chronic substance use disorder to complete a substance use treatment program and be in remission, based on substance use treatment experience.
Rate of Completing SU TX for Chronic Problems	flow	Person/ Month	PLWH receiving SUBSTANCE USE TREATMENT * Prop of PLWH with SU TX needs who have chronic SU disorder * (1 - Prop of PLWH with SU TX needs who drop out before completing SU TX) / Time to Complete SU TX for PLWH with chronic SU disorders {UNIFLOW}	Monthly rate at which PLWH with chronic substance use disorder become clean and no longer need substance use treatment.
Prop of PLWH with short term SU TX needs who complete treatment	auxiliary	dmnl	1 - (Prop of PLWH with SU TX needs who drop out before completing SU TX + Prop of PLWH with SU TX needs who have chronic SU disorder)	Stakeholder-estimated[a] proportion of all PLWH with short-term substance use disorder. This estimate is based on medical case management and substance use treatment experiences.
Time to Complete SU TX for Short Term Problems	auxiliary	Months	24	Stakeholder-estimated[a] time needed for a PLWH with short-term substance use disorder to complete a substance use treatment program and be in remission, based on substance use treatment experience.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Rate of Completing SU TX for Short Term Problems	flow	Person/ Month	PLWH receiving SUBSTANCE USE TREATMENT * (Prop of PLWH with short term SU TX needs who complete treatment) * (1 - Prop of PLWH with SU TX needs who drop out before completing SU TX) / Time to Complete SU TX for Short Term Problems {UNIFLOW}	Monthly rate at which PLWH with short-term substance use disorder become clean and no longer need substance use treatment.
PLWH Previously Receiving SUBSTANCE USE TREATMENT	stock	Persons	PLWH Previously Receiving SUBSTANCE USE TREATMENT(t - dt) + (Rate of Completing SU TX for Chronic Problems + Rate of Completing SU TX for Short Term Problems - Rate of Recurrent SU Problems - Mortality of PLWH Who Previously Received SU TX) * dt **Initial value** = 1040	Number of PLWH over time with previous substance use disorder who are have completed substance use treatment and no longer need it.
Mortality of PLWH Who Previously Received SU TX	flow	Person/ Month	HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month * PLWH Previously Receiving SUBSTANCE USE TREATMENT {UNIFLOW}	Monthly rate of PLWH who previously needed substance use treatment 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.
Prop of PLWH Previously Treated with Recurring SU Disorders	auxiliary	dmnl	.4	Stakeholder-estimated[a] proportion of all PLWH previously treated for substance use disorder who relapse and need treatment again. This estimate is based on medical case management and substance use treatment experiences.
Time for SU Disorders to Recur	auxiliary	Months	24	Stakeholder-estimated[a] time in which a PLWH previously treated for substance use disorder relapses and needs treatment again, based on substance use treatment experience.
Rate of Recurrent SU Problems	flow	Person/ Month	PLWH Previously Receiving SUBSTANCE USE TREATMENT * Prop of PLWH Previously Treated with Recurring SU Disorders / Time for SU Disorders to Recur {UNIFLOW}	Monthly rate at which PLWH previously treated for substance use disorder relapse and need substance use treatment again.
Unmet Substance Use (SU) Treatment (TX) Need and Effects				
Prop of UNMET SU TX NEEDS	auxiliary	dmnl	PLWH needing SUBSTANCE USE TREATMENT / (PLWH needing SUBSTANCE USE TREATMENT + PLWH receiving SUBSTANCE USE TREATMENT)	Model-generated proportion of PLWH who need substance use treatment over all PLWH receiving and needing substance use treatment, defined as unmet substance use treatment needs.
Effect of unmet need for SU TX on Lost to Care Rate	auxiliary	dmnl	GRAPH(Prop of UNMET SU TX NEEDS) (0.000, 0.000), (0.0714, 1.075), (0.143, 1.333), (0.214, 1.475), (0.286, 1.617), (0.357, 1.717), (0.429, 1.800), (0.500, 1.867), (0.571, 1.917), (0.643, 1.933), (0.714, 1.933), (0.786, 1.925), (0.857, 1.933), (0.929, 1.950), (1.000, 1.950)	This is a graphic function of the relationship between unmet need for substance use treatment and the effect of unmet treatment need on the rate of PLWH who miss medical appointments and those who become lost to care. This relationship follows a non-linear S-curve, with lowest proportion unmet needs for substance use treatment (0.000) is associated with the lowest effect on the lost to care rate (0.000), and highest proportion of unmet substance use treatment needs (1.000) is associated with highest effect on the lost to care rate (1.950). (Interim points on the S-curve graph are indicated in the formula and in **Fig. 5.4**.) This variable is exported to the "Medical Care Services" module as a contributor to the "Effect of Unmet Needs on Risk of being Lost to Care" variable, which is a multiplier in both the no show rate and the lost to care rate.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Mental Health (MH) Care Resources and Capacity				
Max Number of MH CARE patients	auxiliary	Person	750	Stakeholder-estimated[a] number of mental health (MH) care slots available to treat PLWH in the catchment area. Because there is no way to substantiate this number given the array of mental health care types available to the total population in the catchment area, this figure represents a stakeholder consensus best estimate for maximum MH care slots available to PLWH at any point in time.
Capacity Effect on New MH Patients	auxiliary		GRAPH((Max Number of MH CARE patients-PLWH receiving MENTAL HEATH CARE) / Max Number of MH CARE patients) (0.000, 0.000), (0.01, 0.047), (0.02, 0.315), (0.03, 0.549), (0.04, 0.651), (0.05, 0.787), (0.06, 0.894), (0.07, 0.953), (0.08, 0.966), (0.09, 0.991), (0.100, 1.000)	Graphic function of the effect of mental health (MH) care capacity on PLWH initiating mental health care over time during simulations. Capacity effect is graphed in relation to the capacity of PLWH to initiate mental health care on a non-linear S curve, with lowest mental health care capacity (0.000) associated with lowest capacity effect (0.000), and highest MH care capacity (0.100) associated with highest capacity effect (1.000). (Interim points on the S-curve graph are indicated in the formula and in **Fig. 5.5**.) Capacity effect is a multiplier in the rate of PLWH beginning mental health care.
Expected PLWH wait time for MH CARE	auxiliary	Month	2	Stakeholder-estimated[a] wait time for PLWH to be able to access mental health care in the catchment area after initiating a request, based on case management experiences.
Mental Health (MH) Care Services Utilization				
Estimated prop of PLWH who have MENTAL HEALTH CARE NEEDS at diagnosis	auxiliary	dmnl	.75	Stakeholder-estimated[a] proportion of PLWH who have mental health care needs at diagnosis, based on case management experiences.
Rate of Newly Diagnosed PLWH Initially Without MH Care Needs	flow	Person/ Month	HIV TESTING AND PREVENTION SERVICES.Total HIV positive tests per month * (1 - Estimated prop of PLWH who have MENTAL HEALTH CARE NEEDS at diagnosis) {UNIFLOW}	Monthly rate of newly infected PLWH joining the stock of those who do not have mental health care needs. The rate of newly infected is being imported from the "HIV Testing and Prevention" module.
PLWH Without MH Care Needs When Initially Diagnosed	stock	Persons	PLWH Without MH Care Needs When Initially Diagnosed(t - dt) + (Rate of Newly Diagnosed PLWH Initially Without MH Care Needs - Rate of PLWH Later Developing MH Care Needs - Mortality of PLWH Without Initial MH Care Needs) * dt **Initial value** = 1500	Number of PLWH who do not have need for mental health care services over time.
Mortality of PLWH Without Initial MH Care Needs	flow	Person/ Month	HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month * PLWH Without MH Care Needs When Initially Diagnosed {UNIFLOW}	Monthly rate at which PLWH who do not have mental health care needs 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.
Prop of PLWH Later Developing MH Care Needs	auxiliary	dmnl	.05	Stakeholder-estimated[a] proportion of PLWH who do not have mental health care needs at intake but develop them and need mental health care later on.
Time to Later Develop MH Care Needs	auxiliary	Months	36	Stakeholder-estimated[a] time it takes for PLWH who do not have mental health care needs at diagnosis to develop them later on.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Rate of PLWH Later Developing MH Care Needs	flow	Person/ Month	PLWH Without MH Care Needs When Initially Diagnosed * Prop of PLWH Later Developing MH Care Needs / Time to Later Develop MH Care Needs {UNIFLOW}	Monthly rate at which PLWH who did not have mental health care needs at diagnosis develop them later on and are pending receiving mental health care.
Rate of Newly Diagnosed PLWH seeking MH care	flow	Person/ Month	HIV TESTING AND PREVENTION SERVICES.Total HIV positive tests per month * Estimated prop of PLWH who have MENTAL HEALTH CARE NEEDS at diagnosis {UNIFLOW}	Monthly rate at which PLWH who have mental health care needs at HIV diagnosis are pending receiving care.
PLWH pending MENTAL HEALTH CARE	stock	Persons	PLWH pending MENTAL HEALTH CARE(t - dt) + (Rate of Newly Diagnosed PLWH seeking MH care + Rate of Recurrent MH Problems + Rate of PLWH Later Developing MH Care Needs - Rate of PLWH beginning MH care - Mortality of PLWH with Pending MH Care Needs) * dt {NON-NEGATIVE} **Initial value** = 100	Number of PLWH over time who have mental health care needs. This includes those who need treatment at HIV diagnosis and those who did not but developed mental health care needs later on.
Mortality of PLWH with Pending MH Care Needs	flow	Person/ Month	HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month * PLWH pending MENTAL HEALTH CARE {UNIFLOW}	Monthly rate of PLWH awaiting mental health care 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.
Prop of PLWH with MH care needs who seek treatment	auxiliary	dmnl	.75	Stakeholder-estimated[a] proportion of all PLWH with mental health care needs who seek care. This estimate is based on case management experiences.
Rate of PLWH beginning MH care	flow	Person/ Month	PLWH pending MENTAL HEALTH CARE * Prop of PLWH with MH care needs who seek treatment * Capacity Effect on New MH Patients / Expected PLWH wait time for MH CARE {UNIFLOW}	Monthly rate of PLWH with mental health care needs initiating care, based on available mental health care capacity in the catchment area.
PLWH receiving MENTAL HEATH CARE	stock	Persons	PLWH receiving MENTAL HEATH CARE(t - dt) + (Rate of PLWH beginning MH care - Rate of Completing MH Care for Chronic Problems - Rate of Completing MH Care for Short Term Problems - Mortality of Patients Receiving MH Care) * dt {NON-NEGATIVE} **Initial value** = 750	Number of PLWH with mental health care needs who are receiving any form of care over time.
Mortality of Patients Receiving MH Care	flow	Person/ Month	HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month * PLWH receiving MENTAL HEATH CARE {UNIFLOW}	Monthly rate at which PLWH receiving mental health care 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.
Prop of PLWH with MH Care Needs for Chronic Problems	auxiliary	dmnl	.5	Stakeholder-estimated[a] proportion of all PLWH with chronic mental health care needs. This estimate is based on medical case management experiences.
Time to Complete MH Care for Chronic MH Problems	auxiliary	Months	120	Stakeholder-estimated[a] time needed for a PLWH with chronic mental health care needs to complete a mental health care program, based on treatment experience.
Rate of Completing MH Care for Chronic Problems	flow	Person/ Month	PLWH receiving MENTAL HEATH CARE * Prop of PLWH with MH Care Needs for Chronic Problems / Time to Complete MH Care for Chronic MH Problems {UNIFLOW}	Monthly rate at which PLWH with chronic mental health care needs no longer need mental health care.
Time to Complete MH Care for Short Term Problems	auxiliary	Months	12	Stakeholder-estimated[a] time needed for a PLWH with short-term mental health care needs to complete a mental health care program, based on treatment experience.

Variable Name	Variable Type	Unit	Initial Parameter Values and Formulas	Variable Definition/Specification and Sources of Initial Parameters and Stock Values
Rate of Completing MH Care for Short Term Problems	flow	Person/ Month	PLWH receiving MENTAL HEATH CARE * (1 - Prop of PLWH with MH Care Needs for Chronic Problems) / Time to Complete MH Care for Short Term Problems {UNIFLOW}	Monthly rate at which PLWH with short-term mental health care needs no longer need mental health care.
PLWH Previously Receiving MH Care	stock	Persons	PLWH Previously Receiving MH Care(t - dt) + (Rate of Completing MH Care for Chronic Problems + Rate of Completing MH Care for Short Term Problems - Rate of Recurrent MH Problems - Mortality of PLWH Who Previously Received MH Care) * dt **Initial value** = 950	Number of PLWH over time with previous mental health care needs who are have completed care and no longer need it.
Mortality of PLWH Who Previously Received MH Care	flow	Person/ Month	HIV INFECTION AND TREATMENT AS PREVENTION.Prop deaths of PLWH per month * PLWH Previously Receiving MH Care {UNIFLOW}	Monthly rate at which PLWH who previously needed mental health care 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.
Prop of PLWH Previously Treated who have Recurring MH Problems	auxiliary	dmnl	.4	Stakeholder-estimated[a] proportion of all PLWH previously treated for mental health care needs who subsequently develop mental health care needs again. This estimate is based on medical case management experiences.
Time for MH Problems to Recur	auxiliary	Months	24	Stakeholder-estimated[a] time needed for a PLWH previously treated for mental health care needs to need care again, based on case management experience.
Rate of Recurrent MH Problems	flow	Person/ Month	PLWH Previously Receiving MH Care * Prop of PLWH Previously Treated who have Recurring MH Problems / Time for MH Problems to Recur {UNIFLOW}	Monthly rate at which PLWH with short-term mental health care needs no longer need mental health care, defined as unmet MH care needs.
Unmet Mental Health (MH) Care Need and Effects				
Prop of UNMET MH CARE NEEDS	auxiliary	dmnl	PLWH pending MENTAL HEALTH CARE / (PLWH pending MENTAL HEALTH CARE + PLWH receiving MENTAL HEATH CARE)	Model-generated proportion of PLWH who need mental health care over all PLWH receiving and needing mental health care.
Effect of unmet need for MH CARE on Lost to Care Rate	auxiliary	dmnl	GRAPH(Prop of UNMET MH CARE NEEDS) (0.000, 0.008), (0.071, 0.108), (0.143, 0.167), (0.214, 0.383), (0.286, 0.550), (0.357, 0.808), (0.429, 1.108), (0.500, 1.433), (0.571, 1.658), (0.643, 1.817), (0.714, 1.900), (0.786, 1.925), (0.857, 1.950), (0.929, 2.000), (1.000, 2.000)	This is a graphic function of the relationship between the proportion unmet need for mental health care and the effect of unmet MH care needs on the rate of PLWH who miss medical appointments and those who become lost to care. This relationship follows a non-linear S-curve, with lowest proportion unmet needs for mental health care (0.000) associated with the lowest effect on the lost to care rate (0.008), and highest proportion of unmet mental health care needs (1.000) associated with highest effect on the lost to care rate (2.000). (Interim points on the S-curve graph are indicated in the formula and in **Fig. 5.6**.) This variable is exported to the "Medical Care Services" module as a contributor to the "Effect of Unmet Needs on Risk of being Lost to Care" variable, which is a multiplier in both the no show rate and the lost to care rate.

[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. 5.1 Capacity Effect on Initiating Housing Support

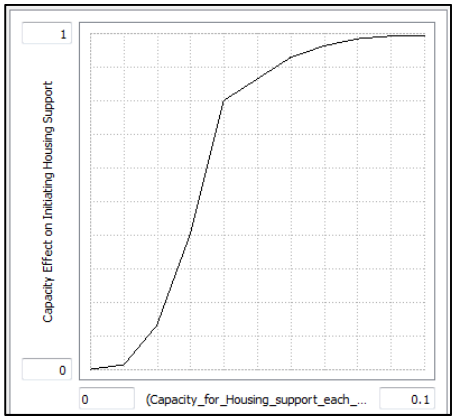

Fig. 5.2 Effect of unmet need for HOUSING SERVICES on Lost to Care Rate

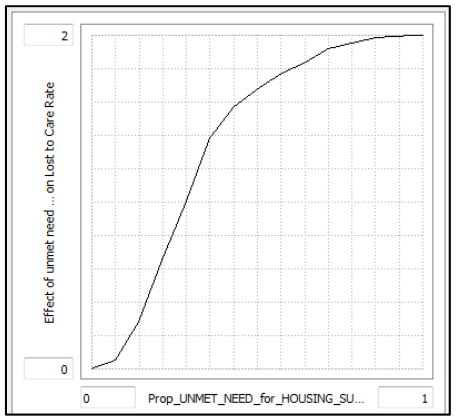

Fig. 5.3 Capacity Effect on New SU TX Patients

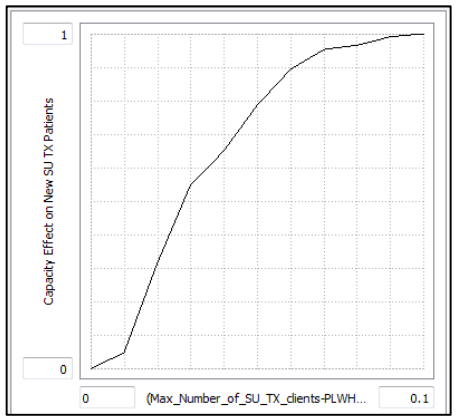

Fig. 5.4 Effect of unmet need for SU TX NEEDS on Lost to Care Rate

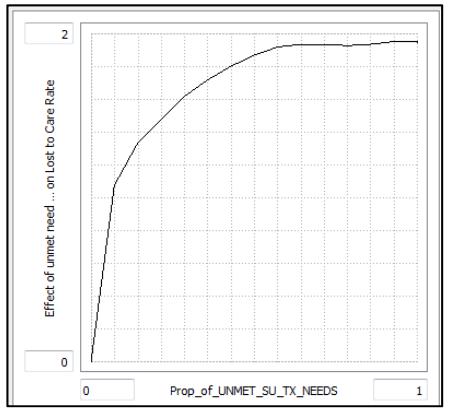

Fig. 5.5 Capacity Effect on New MH Patients

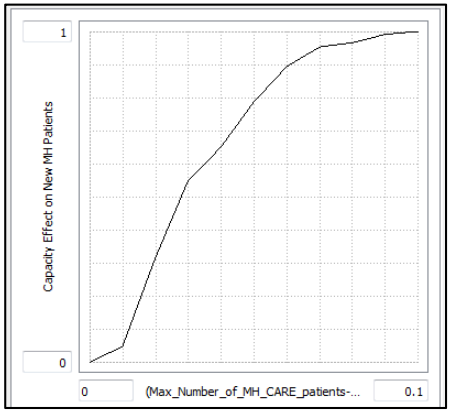

Fig. 5.6 Effect of unmet need for MH CARE NEEDS on Lost to Care Rate