

Modeling breast cancer patient, communication and treatment factors in discontinuation of daily adjuvant treatment over time

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Demographics of Patients

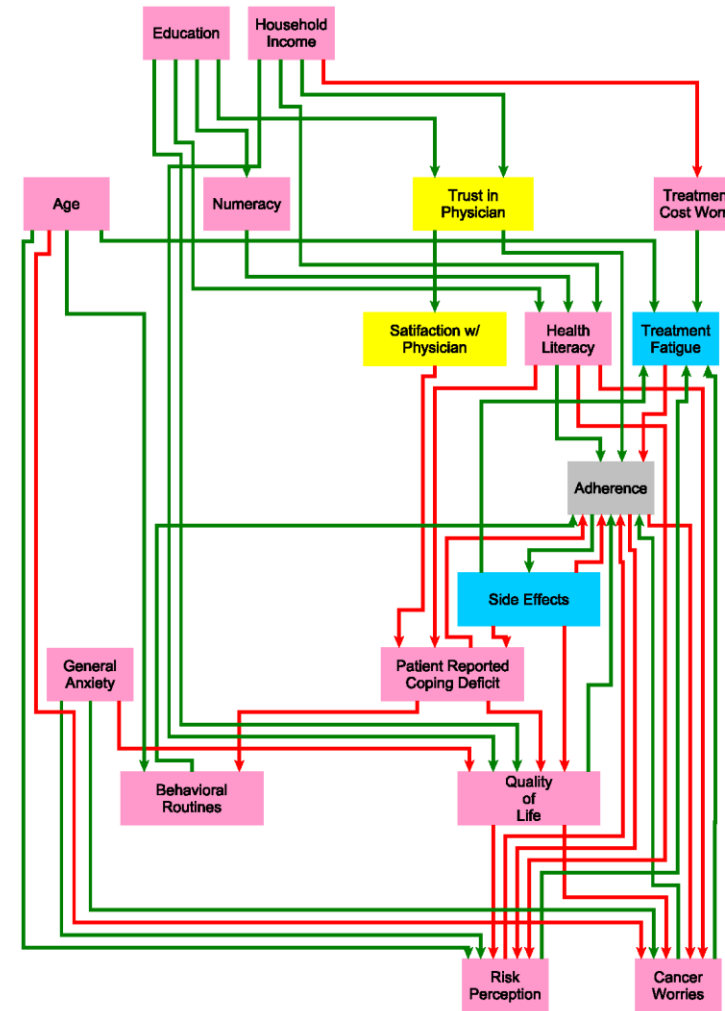
The demographics of patients that had been previously treated for estrogen receptor positive (ER+) breast cancer staged I-III. The data collected from these patients is used to construct a qualitative logical network model to better understand the dynamics around adhering to endocrine therapy.

	Discontinued (n = 40)		Still taking (n = 176)		
Characteristic	N	%	N	%	p-value
What is your age?					0.623
N	22		60		
Mean (SD)	64.0 (13.24)		63 (12.03)		
Median	64.1		63.5		
Min-Max	40 - 88		36 - 91		
What is your race?					0.987
White	20	90.9	47	78.3	
African American	2	9.1	6	10.0	
Asian	0	0.0	4	6.7	
Other	2	9.1	3	5.0	
What is your Ethnic Background?					0.393
Hispanic	12	54.5	39	65.0	
Not Hispanic	10	45.5	21	35.0	
What is your highest level of education					0.874
High school or GED	4	18.2	10	16.7	
Some college	8	36.4	12	20.0	
College Degree	8	36.4	22	36.7	
Master's or higher	5	22.7	16	26.7	
What is your marital status					0.007
Married	20	90.9	39	65.0	
Never Married	1	4.5	4	6.7	
Divorced	0	0.0	11	18.3	
Widowed	1	4.5	6	10.0	
Breast Cancer Stage					0.980
Stage I	6	27.3	17	28.3	
Stage II	11	50.0	29	48.3	
Stage III	5	22.7	14	23.3	
Surgery					0.934
Mastectomy	21	95.5	57	97.0	
Lumpectomy	1	4.5	3	5.0	
Chemotherapy					0.232
No	19	86.4	45	75.0	
Yes	3	13.6	15	25.0	
Radiation					0.566
No	10	54.5	23	61.7	
Yes	12	45.5	37	38.3	
Number of Assessment Timepoints					0.081
Mean (SD)	4.5 (1.14)		4.1 (1.01)		
3	5	22.7	22	36.7	
4-7	17	77.3	38	63.3	

Putative Causal Behavior Logic Circuit

The logic model, constructed using expert knowledge, consisting of 17 patient, treatment, and physician-relationship factors. This network model was then parameterized using Constraint Satisfaction Programming (via the MiniZinc language).

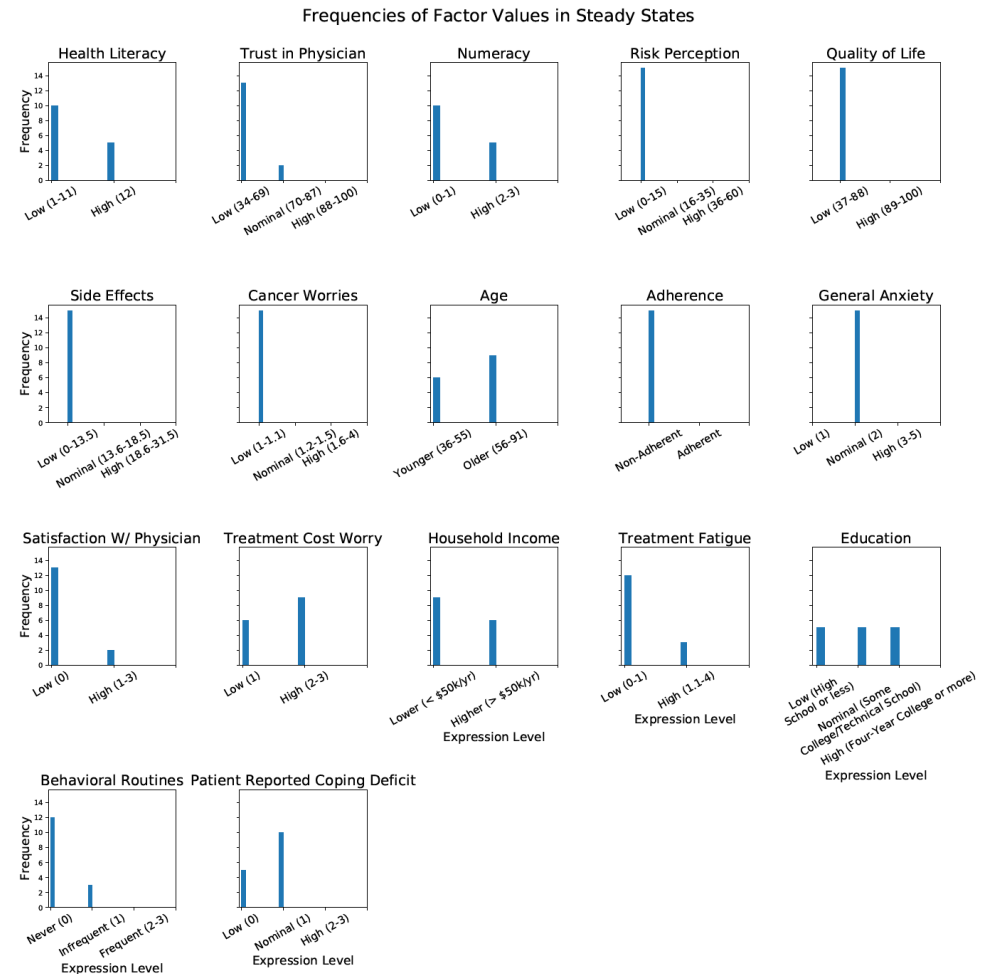
The decisional logic was constrained using survey data to discover the dynamics of how these factors interact. The parameterizations were identified using the Chuffed solver, and resulted in 96 competing parameterizations (all of which had approximately the same objective value). These parameterizations took 3 days of computing to discover using TACC.



Distribution of Factor Levels in End-states

For all 96 parameterizations, end-states (or attractors) were discovered using a random sampling of start states. 15 end-states were discovered, and the distribution of the expression levels of each factor is shown here.

Note that all end-states are non-adherent, which suggests that adherence to endocrine therapy is not stable.



End-state Demographics with Corresponding Interventions

If adherence to endocrine therapy (ET) is not stable, what interventions can be used to help patients become adherent? This figure demonstrates the primary demographics for the 15 end-states: age, income, and education, and the intervention necessary for the patient to become adherent to ET.

The proposed treatments to increase the likelihood of adherence to ET are shown by the ovals. They are an increase in a patient's Trust in Medical System (TMS), an increase in a Beneficial Routine (BR), and a decrease in Generalized Anxiety (GA). Additionally, for patients with low or nominal education, an increase in Health Literacy (HL) is needed.

