

Patient Preferences for Diagnostic Imaging Services

Blueprint for Value-Based Incentives Incorporating Individual Preference Heterogeneity

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Acknowledgment



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Background



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- Recent years have seen a large effort to shift from a volume-based medical care system to one that rewards provision of value to patients
- Value is generally defined using measures of care coordination, cost-effectiveness and health outcomes
- This system tends to lack actual patient preferences for what those value definitions should be
- There remain significant barriers to including patients in this shared decision-making process

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Background (cont.)

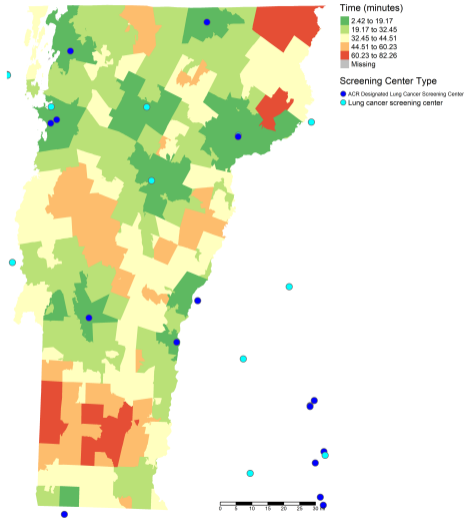


- Diagnostic services, and Radiology departments in particular, are a keystone to care-coordination regimens because of their multidimensional capacity for diagnostic services across medical branches
- As diagnostic imaging demands and costs escalate, there are significant negative impacts on provider productivity and patient satisfaction
- Often, patients are having to have their images read twice at different facilities, incurring added costs and inefficiencies
- Retail diagnostics has emerged across the State of Vermont (and the USA), as a potential solution

Visualizing Need



Travel Time to Lung Cancer Screening in Vermont



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Purpose



- Retail diagnostics allows for evaluation by specialists regardless of location, cutting wait-times, and increasing access
- Develop a Discrete Choice Experiment (DCE) to model how patient choices are affected by common measures of value
- Our objective was to identify preferences for diagnostic imaging services and analyze how patients make trade-offs between attributes of services
- Advise hospital management whether decentralizing some imaging services to an outside kiosk or clinic will provide value to patients while improving access and lowering costs



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Qualitative Work



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- Two focus groups were performed in a semi-structured manner with patients in the Vermont health network, each with 12 participants, and lasting between 90 and 120 minutes.
- Themes included: overarching trust in system and referring providers; preference for transparent and informative communication; personal interaction and compassionate bedside manner from staff; and accessibility of radiology services and the facility.
- This preliminary work helped define the key attributes and levels for a discrete choice experiment (DCE), which were refined through three pilot studies over the course of two years.
- Two D-efficient designs were generated with 14 choice tasks each, with three unlabeled alternatives to choose from.

DCE Structure



Two stated-choice experiments were designed to represent an acute patient need, and a sub-acute need:

- Situation 1): "For the purpose of this study, suppose you hurt your arm and your primary care provider wants to send you for an x-ray. You have three options of locations where you can have your imaging done."
- Situation 2): "For the purpose of this study, suppose you hurt your arm a while ago, and are having persistent pain. Your primary care provider wants to send you for an MRI. You have three options of locations where you can have your imaging done."

At the start of the survey, participants were asked to input characteristics of the clinic where they usually receive radiology care (if they previously have), which were later used as reference levels in a pivot design.



Choice Task Example

- Continuous attributes were pivoted around subject's "status quo" facility attributes, $\pm 25\%$, or one service star

	Clinic 1	Clinic 2	Clinic 3
Interpreting Radiologist	General Radiologist	Specialty Radiologist	General Radiologist
Primary Care Recommendation	Yes	No	Yes
Time to Results	18 hours	24 hours	30 hours
Cost	\$50	\$40	\$50
Wait Time	10 days	10 days	8 days
Travel Time	22 minutes	37 minutes	22 minutes
Parking Cost	Paid	Free	Paid
Parking Accessibility	7.5 minutes	12.5 minutes	7.5 minutes
Service	3 Star. ***	4 Star. ****	2 Star. **
Online Scheduling	Not Available	Available	Not Available
Which would you choose?	<input type="radio"/> Clinic 1	<input type="radio"/> Clinic 2	<input type="radio"/> Clinic 3

Figure: Example Choice Task

Sampling Frame



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- Administered using SurveyEngine platform
- Primary data from representative sample of the U.S. state of Vermont, balanced on age and gender
- Sampled from an online Centiment panel between May 16, 2022 and June 24th, 2022
- Total N = 200 (X-Ray sample N = 100, MRI sample N = 100)

Analytic Approach



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- We analyzed the data using a mixed logit with random parameters, estimated using maximum log likelihood
- Mixed logit allows for inclusion of health behaviors, formative measures, and demography, allowing for individual-level intercepts and preference heterogeneity, including unobserved characteristics



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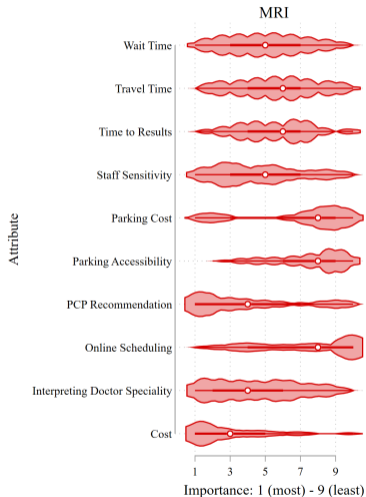
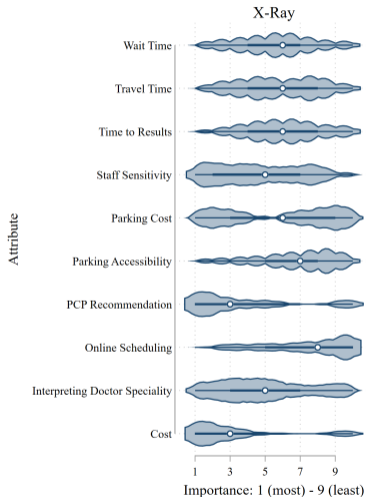
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Respondent Demographics



	Group			
	X-Ray		MRI	
Age (mean, sd)	46.2	(16.4)	49.0	(16.3)
Income (USD) (mean, sd)	\$44,747	(\$37,011)	\$51,386	(\$47,819)
Number of Previous Images (mean, sd)	4.8	(1.6)	2.9	(1.8)
Gender Identity (% , n)				
Male	33.7%	31	31.2%	29
Female	63.0%	58	67.7%	63
Non-Binary	3.3%	3	1.1%	1
Race (% , n)				
White	95.7%	88	95.7%	89
Black	1.1%	1	1.1%	1
Asian	0.0%	0	2.2%	2
AIAN	2.2%	2	1.1%	1
Multiple	1.1%	1	0.0%	0
Ethnicity: Hispanic (% , n)	5.4%	5	1.1%	1
Rurality (% , n)				
Urban	12.0%	11	9.7%	9
Suburban	29.3%	27	16.1%	15
Rural	58.7%	54	74.2%	69
Chronic Condition (% , n)	48.9%	45	50.5%	47

Importance of Attributes



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Mixed Logit Results: Main Effects

	MRI - Base	X-Ray - Base
Interpreting Doctor Specialty	0.732 **** (0.110)	0.426 **** (0.118)
Clinic Recommended by PCP	0.616 **** (0.107)	0.770 **** (0.158)
Wait Time to Results	-0.008 * (0.004)	-0.008 *** (0.003)
Out of Pocket Cost	-0.006 **** (0.001)	-0.008 *** (0.003)
Wait Time to Appointment	-0.001 (0.015)	0.040 **** (0.010)
Travel Time to Clinic	0.006 (0.006)	0.022 ** (0.010)
Clinic Parking Cost	0.251 *** (0.096)	0.643 **** (0.102)
Clinic Parking Lot Distance	-0.040 * (0.022)	-0.016 ** (0.007)
Clinic Service Rating	0.510 **** (0.101)	0.426 **** (0.123)
Online Scheduling Availability	0.237 *** (0.088)	0.313 **** (0.077)
ASC: Clinic 2	-0.084 (0.080)	-0.130 (0.083)
ASC: Clinic 3	-0.100 (0.082)	-0.189 ** (0.083)
Number of observations	4185	4140

**** p<.001, *** p<.01, ** p<.05, * p<.1

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Mixed Logit Results: Interaction Effects

	MRI - Interaction	X-Ray Interaction
Interpreting Doctor Specialty	0.750 **** (0.111)	0.419 **** (0.121)
Clinic Recommended by PCP	0.630 **** (0.109)	0.692 **** (0.154)
Wait Time to Results	-0.007 (0.004)	-0.008 *** (0.003)
Out of Pocket Cost	-0.006 **** (0.001)	-0.009 *** (0.003)
Wait Time to Appointment	-0.001 (0.015)	0.040 **** (0.010)
Travel Time to Clinic	-0.001 (0.012)	0.047 (0.029)
Clinic Parking Cost	0.206 ** (0.097)	0.646 **** (0.104)
Clinic Parking Lot Distance	-0.041 * (0.022)	-0.016 ** (0.007)
Clinic Service Rating	0.447 **** (0.100)	0.387 *** (0.120)
Online Scheduling Availability	0.214 ** (0.088)	0.308 **** (0.078)
Rurality # Travel Time to Clinic		
Suburban	0.014 (0.019)	-0.037 (0.030)
Rural	0.011 (0.013)	-0.027 (0.031)
ASC: Clinic 2	-0.092 (0.080)	-0.126 (0.083)
ASC: Clinic 3	-0.097 (0.082)	-0.187 ** (0.083)
Number of observations	4185	4140

**** p<.001, *** p<.01, ** p<.05, * p<.1

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Marginal Rates of Substitution



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Attribute	WTP	
	MRI	X-Ray
Radiologist Specialty	131.61	51.82
PCP Recommendation	110.80	93.72
Time to Results	NS	-0.99
Travel Time to Clinic	NS	NS
Wait Time to Appointment	NS	4.89
Service Quality	91.76	51.85
Free Parking	45.14	78.22
Parking Accessibility	NS	NS
Online Scheduling Available	42.71	38.12



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- All participants placed high value on PCP recommendation
- High value on radiologist specialty for chronic participants
- Parking more important in acute scenarios
- Free parking and easy online scheduling are potential drivers of value for patients seeking X-Ray
- At the conclusion of each DCE, participants were asked to rank the attributes in order from most important to their choices to least, enabling comparison of self-stated and model-estimated attribute prioritization, which were found to be strongly concordant

Discussion & Next Steps



- We hypothesize that in healthcare, people do not universally behave in alignment with the assumptions of RUM
- Therefore, we hope to explore non-compensatory modeling approaches, such as elimination by aspects, in addition to random regret, and mixture LC models
- We also hope to get input on how to address non-linearity in our attributes (due both to subject pivoting and underlying preference structure)

Questions?



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Thank you! Any questions?

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