

Regular article

The effects of time and money prices on treatment attendance for methadone maintenance clients

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Abstract

Many methadone maintenance clients are required to visit a clinic daily, so treatment attendance is essential for clients' compliance and treatment effectiveness. Using data derived from a unique survey, this study provides evidence of economic barriers to regular treatment attendance. Hypotheses tested are (1) higher personal costs reduce treatment attendance, and (2) willingness to pay (WTP) provides better time price estimates than wage rates. The findings suggest that both time and money function as rationing devices for methadone maintenance clients. The study finds WTP preferable to wage rate in measuring time price as evaluated by the effects of time price on treatment attendance. © 2004 Elsevier Inc. All rights reserved.

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1. Introduction

Methadone treatment, one of the most widely used treatment modes for opiate addiction, is an unusual health care model. First, because many clients are required to visit a clinic every day (although some have take-home doses for some days), treatment attendance becomes essential for patient compliance and treatment effectiveness. Second, irregular attendance has implications for the potential waste of staff time resources and the underutilization of equipment.

Potential methadone maintenance clients encounter barriers related to treatment costs. Out-of-pocket treatment fees are generally modest due to extensive private and public insurance coverage, but out-of-pocket transportation, childcare, travel and waiting time costs may be substantial and possibly prohibitive. Clients facing higher treatment fees, higher transportation and childcare costs, and longer travel and waiting times may attend treatment less regularly.

Economists have not addressed the existence or magnitude of economic barriers to methadone treatment. Although

economists would presume the negative impacts of higher costs on treatment attendance or outcomes to be obvious, many clinicians (e.g., Orlinsky, Grawe, & Parks, 1994) believe that overcoming higher barriers indicates *more* commitment to treatment, leading to better results. We investigate the effects of money and time costs on the attendance of methadone maintenance clients. If the economic barriers can be appropriately identified and measured, some way of reducing them or even eliminating them is possible, thus improving treatment attendance.

We use data from a unique survey of methadone maintenance clients to address the extent to which program participation responds to the costs of participation. We present a health care demand model and the first specification uses the wage rate as a proxy for time value for employed individuals, and the reservation wage rate (that wage rate that would lead the unemployed to take a job) as a proxy for the time value for those who are unemployed or not in the labor force. The second specification replaces the wage rate with a willingness to pay (WTP) measure of time value derived through contingent valuation (CV) methods. Finally the third specification calculates the patients' marginal time value from the model's parameter estimates. This imputed time value is then compared to the wage rate and to the WTP to determine whether the model better approximates wages or WTP.

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2. Materials and methods

To determine money and time prices, we surveyed clients in four methadone maintenance clinics in the Detroit Metropolitan Area from March through July 1999. Study data were collected from the clinics' processing records, and through a self-administered 14-question instrument (displayed in its entirety in Borisova & Goodman, 2003). Data collection occurred once each week on random days over a 4-week period in each clinic when neither weather conditions nor holidays were likely to interfere with attendance. Individuals were interviewed once. We believe this to be the first time such a survey has been conducted.

For study purposes, population is defined as "every-day" methadone maintenance clients who attend a substance abuse treatment program 5 to 7 days per week. Clients were approached and asked to participate while waiting for medication. Monetary incentives to participate in the study were offered at that time. For clients who agreed, the nature and purpose of the study were explained. Before completing the questionnaire, clients were asked to provide informed consent. Upon completing the questionnaire, they were paid \$2 for participating in the study. The instrument was designed to be self-administered, but clients were provided with explanations necessary to answer questions. In some cases, the questionnaire was read to the clients in the form of an interview.

Nine percent of the sample (44 of 504) did not appear during the study days. Thirty-four percent of those approached (157 of 460) refused to take part in the study. Thus, 66% of those approached (303 of 460) filled out the questionnaire. Data related to socioeconomic and demographic characteristics were obtained from the clinics' processing records.

In measuring value of time, analysts often assign the wage rate for working clients and as the reservation wage rate for non-working clients (Acton, 1976; Coffey, 1983). However Cauley (1987) lists several factors that may break the equality between wages and the value of time, including not working for market wages, paid sick leave, direct utility or disutility of time spent consuming medical care, and reduction of the opportunity cost of time due to illness. Moreover, unemployed people may value time differently from the wage they could earn.

The CV method uses survey methods to ascertain individuals' valuations of hypothetical alternatives, most often when market data are not available. Contingent valuation methods for measuring WTP have been used extensively in health care demand studies (Johannesson, Johannesson, Kriström, Borgquist, & Jönsson, 1993; Johannesson, Johannesson, Kriström, & Gerdtham, 1993; Johannesson, Jönsson, & Borgquist, 1991; Zarkin, Cates, & Bala, 2000). However, only Tilford (1993), who sought to measure time value for the elderly, used WTP for time valuation in empirical health care demand analysis. Mitchell and Carson review (1989) early WTP studies and Olsen and Smith (2001) provide a more recent review.

In the context of CV methods, WTP corresponds to the maximum amount an individual would be willing to pay to secure the reduction in travel time. The following survey questions were used to assess willingness to pay for travel time:

12. If it took you *twice* as long as usual to travel to this clinic and if you had to pay, what is the MOST money you would be *willing to pay* for each visit?

\$ _____

13. If this clinic were moved right NEXT DOOR to where you live for your convenience and if you had to pay, what is the MOST money you would be *willing to pay* for each visit?

\$ _____

If the second choice (item 13) were preferred to the first choice (item 12), a client would be willing to pay a positive amount for the second choice, i.e. for the elimination of travel time to the treatment program. Willingness to pay corresponds to the maximum amount a client is willing to pay to secure the time reduction for methadone maintenance. Since no actual travel time was specified in the questions, but the time marker is instead related to the client's usual travel time, we expect the answer to produce a time price specific to each client.

The final survey question addressed willingness to accept (WTA) compensation for longer trips, asking:

14. If this clinic were moved back to its original place and offered you money for your inconvenience, what is the LEAST money you would be *willing to receive* for each visit?

\$ _____

This item provides an alternative measure of valuation, as well as a check on the validity of the WTP responses. Borisova and Goodman (2003) report the results of this question, and demonstrate that WTP and WTA were consistent in their measures of time valuation.

2.1. Model specification

The treatment attendance equation follows Grossman's (1972) theory of household health production. In this theory, households purchase health care treatment if the marginal treatment benefit exceeds the full price of health care. The full price of health care is defined as the sum of the money price and time price per unit of health care.

Health care demand is represented by treatment attendance of methadone maintenance clients, relating treatment attendance A to a set of explanatory variables:

$$\begin{aligned}
 A = & \beta_0 + \beta_M \times (\text{average daily money price}) + \beta_T \\
 & \times (\text{average daily time price}) + \beta_3 \\
 & \times (\text{gross household income}) + \beta_z \\
 & \times (\text{other sociodemographic attributes}) \\
 & + \text{error term}
 \end{aligned}
 \tag{1}$$

Treatment attendance is measured as an attendance rate during a treatment episode, and is defined as a ratio of a client's number of days attended to number of days required. We expect the attendance rate to be lower for clients facing higher money and time prices.

2.2. Money price and time price

The money price is defined as a client's out-of-pocket expenses related to the treatment. The out-of-pocket expenses include treatment fees, related childcare costs, and transportation cost. All individuals' out-of-pocket expenses were assessed by the self-administered questionnaire (questions 2 through 7) by asking clients directly how much money they usually pay for their clinic visit, for their usual round-trip transportation, and for the childcare or for care of another person if needed regularly in order to attend treatment. For those clients who drove to their treatment themselves, an average gas price at the time of the study and a client's reported travel time were used to impute the client's average round-trip transportation expense.

The time price is defined as a sum of minutes required to obtain treatment by a client multiplied by the client's value of time. Time required to obtain treatment includes round-trip travel time to a clinic, and waiting time for methadone maintenance at the clinic. We compare three different time price specifications to illustrate that using wage rate as a proxy for value of time may produce different measures of the time price effect than WTP.

The first time price specification uses the wage rate as the value of time for employed individuals, and the reservation wage as the value of time for unemployed individuals who are not in the labor force. We imputed individuals' reservation wages by asking (questionnaire item 9) unemployed clients the minimum wage rate per hour they would be willing to accept to return to the labor market. This method may generate biased time price elasticities if the value of time for methadone maintenance clients is very different from their wage rate.

In the second specification, the wage rate is replaced with WTP. In the context of the study, WTP corresponds to the maximum amount a client is willing to pay to secure the reduction in time requirements for methadone maintenance.

The third time price specification uses Cauley's work in which time requirements enter the model in minutes or hours and are not multiplied by the value of time. Here, the marginal time value can be calculated from the model parameter estimates and compared to those imputed from the wage rate or WTP.

2.3. Other variables

This section briefly reviews the control variables for equation (1). The relevant income measure is family income, since each family member can contribute to household production. The Grossman model suggests that higher

income will lead to better attendance if methadone maintenance is a "normal" good. However, it is possible for the methadone maintenance to be "locally inferior good." Clients with higher incomes may choose to buy drugs on the street rather than spending time traveling to and participating in the methadone maintenance program.

Gender, race, marital status, and age are used to determine differences in treatment attendance among clients' subgroups. Age is entered in quadratic form. According to the health production theory, as people age, their health stocks decrease at increasing rates; thus, with age, individuals' health care use may increase.

Number of times previously in treatment may show the client's determination to become free of drugs. More previous treatments may indicate accumulation of treatment experience and expectations. This is why treatment professionals expect clients with more previous treatments to have higher attendance.

Travel mode and treatment location dummies address remaining differences in obtaining methadone maintenance that may not be captured by the time price. Use of public transportation, taxi, or walking can increase the amount of effort needed to obtain methadone maintenance. Treatment located in the suburbs may require more or less effort compared to treatment located in the central city depending on traffic congestion and the availability of public transportation. Alternatively, suburban treatment sites may be more attractive, cleaner, or safer.

2.4. Estimation methods

Methadone maintenance clients must demonstrate regular attendance to stay in treatment or they will be discharged for noncompliance. It is thus very unlikely that any client will have an attendance rate less than 0.5. In fact, the lowest attendance rate reported in the study sample is 0.58 and it is considered as the lower bound for the attendance rate. Treatment attendance is measured as a rate rather than a count, so it is censored below at 0.58 and above at 1.00.

Conventional least squares regression methods do not distinguish between the limiting observations (here 0.58 below, and 1.00 above) and the continuous observations in between. We use the two-limit Tobit model developed by Rosett and Nelson (1975), which allows both upper and lower censoring, to estimate equation (1). Following Long (1997), the effects of the explanatory variables on the entire sample are related to the magnitudes of the coefficients β and to the probabilities that the observed outcomes are uncensored (that is, between 0.58 and 1.00).

The model is estimated using three time price specifications: (a) time price defined in terms of wage rate; (b) willingness to pay, or WTP; (c) time price entered into the model in natural units (minutes or hours). When specification (c) is used, following De Vany (1974), a time value $\hat{V} = \hat{\beta}_T / \hat{\beta}_M$ is then imputed, where $\hat{\beta}_T$ and $\hat{\beta}_M$ are estimated impacts of time requirements and money prices respectively

from equation (1). The calculated \hat{V} provides a useful comparison to the wage and WTP measures of time price.

3. Results

3.1. Money and time prices

Table 1 examines treatment attendance and money and time prices. About 41% of the sample had attendance rates equal to 1.0, or no missed treatment days. Seventy percent of clients had rates above the mean of 0.97. The negative skewness in the treatment attendance distribution is evident from the small percentage of clients with attendance rates below the average.

A cursory examination suggests that higher money and time prices are associated with lower attendance rates. Treatment fees comprise approximately 51% of the money price. However, travel costs are highest for the clients with attendance rates less than 0.85.

Time prices are calculated using both wage rate and WTP. The time price per treatment day measured by the wage rate is about twice the time price measured by WTP (\$12.27 vs. \$5.71). Even if wage rates were reduced by the relevant marginal wage taxes (15% federal tax for the generally lower income clients + 7.65% Social Security + 3% City of Detroit wage tax for those living and working in Detroit; or 1.5% for those working in Detroit), the after-tax wage rate time price is still considerably higher than the WTP time price. Some of the difference may reflect response bias if those with higher time costs did not participate in the study.

The total treatment cost per client is \$14.34 per treatment day when the time price is measured by the WTP, compared to \$20.90 when the time price is measured by the wage rate. The time price constitutes 40% of the total treatment cost when the time price is measured by WTP, and approximately 59% when measured by the wage rate. The significant share of the time price in the total treatment cost, along with the suggestion that higher time prices are related to lower attendance, implies that time is an important factor.

3.2. Descriptive statistics

Table 2 provides variable definitions and sample means for the treatment attendance model. The sample was about one third African-American and 47% female. Almost one quarter were married, and 45% were employed. Mean age was 41.8 years. Reported annualized gross family income was approximately \$18,000. Mean round trip travel time was about 81 min and mean waiting time was about 31 min. The average money price was \$8.63 and the average estimated time price measured by WTP was \$5.71 per treatment day. The average estimated time price measured by the wage rate was \$12.27 per treatment day.

Dividing clients into two groups according to treatment attendance suggests that clients with one or more missed treatment days have significantly higher money and time prices than clients with no missed treatment days. In fact, the treatment attendance rate has a Pearson correlation coefficient ρ of -0.129 with money price (ρ significant at the 0.05 level) and -0.166 with time price measured by WTP (ρ significant at the 0.01 level).

3.3. Analysis using alternative time price specifications

We consider three different time price specifications. First, time price is defined in terms of WTP, and next in terms of the wage rate. Finally, the time price is entered in natural units and the value of time $\hat{V} = \hat{\beta}_T / \hat{\beta}_M$ is imputed from the model. This imputed value is compared to the wage rate and to WTP to determine whether this model better approximates wages or WTP.

Table 3 presents estimates of treatment attendance with the WTP specification. Economists report percentage impacts of 1% changes in explanatory variables to compare effects of continuous variables that are scaled differently. We also show the percentage impacts of discrete (0, 1) variables on treatment attendance, by evaluating them at the discrete values.

Our results apply only to those for whom we observe treatment attendance. We cannot explain decisions whether to undertake treatment, nor can we model treatment access.

Table 1
Distribution of the treatment attendance, and mean values of money and time prices per treatment day

Attendance range	% of clients	Money price (dollars)				Time price (dollars)		Total price (dollars)	
		Treatment fees	Travel cost	Child care cost	Total	WTP ^b	Wage	Money price + WTP	Money price + wage
A ^a = 1.00	40.6	\$5.04	\$2.80	\$0.16	\$8.00	\$5.45	\$9.98	\$13.45	\$17.98
1.00 > A ≥ 0.99	15.8	\$3.61	\$3.24	\$0.75	\$7.60	\$5.55	\$9.97	\$13.15	\$17.57
0.99 > A ≥ 0.98	14.2	\$4.56	\$3.31	\$0.81	\$8.68	\$5.69	\$11.77	\$14.37	\$20.45
0.98 > A ≥ 0.95	12.5	\$3.61	\$3.90	\$1.39	\$8.90	\$5.56	\$13.37	\$14.46	\$22.27
0.95 > A ≥ 0.85	10.6	\$4.13	\$3.92	\$1.31	\$9.36	\$6.45	\$18.06	\$15.81	\$27.42
0.85 > A ≥ 0.58	16.3	\$4.21	\$5.32	\$3.82	\$13.35	\$6.87	\$22.19	\$20.22	\$35.54
Total mean	–	\$4.42	\$3.36	\$0.85	\$8.63	\$5.71	\$12.27	\$14.34	\$20.90

^a Attendance rate.
^b Willingness to pay.

Table 2
Variable definitions and sample means

Variables	Mean	Mean (A ^a A < 1)	Mean (A A = 1)
Attendance rate	0.97	0.95	1.00
African-American	0.33	0.44	0.17
Women	0.47	0.48	0.45
Employed	0.45	0.41	0.52
Married	0.24	0.24	0.24
Age	41.80	42.05	41.43
Age squared	1,807.82	1,828.49	1,777.57
Clinic in Macomb County (outside central city)	0.32	0.19	0.50
Clinic in Oakland County (outside central city)	0.33	0.31	0.36
Family income (yearly)	18,065.00	17,853.00	18,375.00
Weeks in treatment	80.51	83.17	76.67
Number of previous treatments	1.00	1.19	0.72
Bus	0.18	0.21	0.15
Other transportation	0.02	0.02	0.01
Money price (\$) per day	8.63	9.05	8.00
Time price (\$) per day, measured by Wage	12.27	13.85	9.98
Time price (\$) per day, measured by WTP	5.71	5.88	5.45
Travel time (in minutes)	81.37	91.64	66.34
Waiting time (in minutes)	30.99	33.92	26.71
Observations	303	180	123

^a A is a treatment attendance rate.

These issues, while important, require a different type of sample.

Most of the variables have the anticipated effects on the treatment attendance rate. Money price has a negative effect (significant at the 10% confidence level) with a value of -0.005 . As noted in Table 1 the average out-of-pocket childcare costs were inversely related to the attendance rate, and comprised increasing percentages of money costs as attendance fell. If society cares most about curing addicts with young children, this suggests that improved childcare (while the parent gets treatment) could improve compliance.

The time price effect measured by WTP is significant at the 1% confidence level with a value of -0.004 . The significant negative time price and money price effects imply that both time and money function as rationing devices among clients. Translating the effect into visits per treatment episode provides an intuitive measure. Consider the average treatment episode of 80.5 weeks, with 6 treatment days per week. For a 1-day increase in regular treatment attendance out-of-pocket expenses must be reduced by 42%; or time requirements must be reduced by 53%. Although the effects are small, they are significant, and, taken together, may make the entire treatment regiment more effective.

Race has a clear effect on treatment attendance. African-American clients have a 2% lower (significant at the 1% confidence level) attendance rate than do Caucasian clients. Employment status and treatment program location are also significant predictors of treatment attendance. Women and

single clients have lower attendance rates, although both effects are insignificant. Employed clients attend more regularly than do the unemployed. Clients in both suburban treatment programs (Macomb and Oakland Counties) have about 5% higher attendance rates than clients in the treatment program located in Detroit. The treatment program located in Detroit has significantly higher percentages of African-American clients (74% vs. 14%) that may contribute to the reported differences in treatment attendance rates among treatment programs.

Previous treatments increase treatment attendance. The effect of 0.003 is significant. One explanation is that clients' accumulation of treatment experience over previous treatment episodes prepares them to be more compliant with the current treatment. A second explanation is that this finding reflects unobserved differences among patients. The income effect of -0.006 is significant at the 5% confidence level. The age effect is positive albeit insignificant. Transportation mode does not significantly predict treatment attendance. Independent of time or money price, using public transportation, taxi, or walking to the treatment program have no differential effects (from driving) on treatment attendance.

Table 4 uses the wage rate (rather than WTP) specification of the time price. Here neither money price nor time price produce the expected effects. Money price has a negative but insignificant effect on treatment attendance

Table 3
Estimates of the treatment attendance rate using WTP specification of the time price

Variable	Parameter	T-Ratio	Effect [†]
Intercept	0.9586	12.25***	–
African-American	-0.0347	-3.13***	-0.0179
Women	-0.0071	-0.77	-0.0036
Employed	0.0181	1.81*	0.0093
Married	0.0082	0.77	0.0042
Age	-6.97E-04	-0.19	0.0184
Age squared	1.84E-05	0.41	–
Clinic in Macomb County (outside central city)	0.1118	7.82***	0.0577
Clinic in Oakland County (outside central city)	0.0896	6.32***	0.0462
Family income (per week)	-3.4E-05	-2.06**	-0.0061
Weeks in treatment	-5.5E-05	-1.04	-0.0023
Previous treatment	0.0065	1.65*	0.0033
Bus	0.0109	0.89	0.0056
Other transportation	0.0354	1.03	0.0183
Money price (per week)	-1.9E-04	-1.68*	-0.0051
Time price_WTP (per week)	-4.2E-04	-2.84***	-0.0044
Observations		303	
Pr (uncensored)		0.5004	

* Statistic is significant at the 0.10 level (2-tailed).

** Statistic is significant at the 0.05 level (2-tailed).

*** Statistic is significant at the 0.01 level (2-tailed).

† Defined as change brought about by 1% increase in continuous variables and change from 0 to 1 for discrete variables.

Table 4
Estimates of the treatment attendance rate using the wage rate specification of the time price

Variable	Parameter	T-Ratio	Effect [†]
Intercept	0.9602	12.06***	–
African-American	–0.0365	–3.22***	–0.0188
Women	–0.0044	–0.46	–0.0023
Employed	0.0201	1.97**	0.0103
Married	0.0081	0.75	0.0042
Age	–0.0019	–0.50	–0.0089
Age squared	3.62E–05	0.78	–
Clinic in Macomb County (outside central city)	0.1189	7.82***	0.0612
Clinic in Oakland County (outside central city)	0.0908	6.18***	0.0468
Family income (per week)	–4.63E–05	–2.47**	–0.0083
Weeks in treatment	–5.01E–05	–0.94	–0.0021
Previous treatment	0.0062	1.53	0.0032
Bus	0.0076	0.54	0.0039
Other transportation	0.0301	0.87	0.0155
Money price (per week)	–1.64E–04	–1.42	–0.0044
Time price–wage rate (per week)	1.09E–04	0.99	0.0045
Observations		303	
Pr (uncensored)		0.4997	

** Statistic is significant at the 0.05 level (2-tailed).

*** Statistic is significant at the 0.01 level (2-tailed).

[†] Defined as change brought about by 1% increase in continuous variables and change from 0 to 1 for discrete variables.

of – 0.004. Time price measured by the wage rate produces a *positive* and insignificant effect on the treatment attendance of 0.005. This finding suggests that using the wage rate as a proxy of time value may lead to inaccurate measures of the time price effect. Tilford (1993) reported similar finding for elderly health care demand model. All other variables have similar effects on treatment attendance as in the WTP specification.

In the third specification we calculate the marginal value of time $\hat{V} = \hat{\beta}_T / \hat{\beta}_M$. Using a sample of prepaid group practice members, Cauley found the marginal time values in the demand for medical care to be close to the median wage rate for employed individuals. Table 5 presents estimates where the time price is entered in minutes. Travel and waiting times are entered separately. Further, travel time value could be different for various client subgroups. To capture this possible differences, four travel time interaction variables were created for (1) employed clients, (2) women, (3) African-American clients, and (4) married clients.

The imputed marginal value of travel time is the sum of the parameter estimate for the travel time variable and the parameter estimates for all relevant interaction variables divided by the parameter estimate for the money price variable. For employed clients the value of travel time estimate would equal the sum of estimates for the travel time variable and the interaction variables, then divided by the estimate for the money price variable. The average

marginal value of time is obtained by taking a weighted average of the separate estimates.

From Table 5, the implied marginal travel time value in obtaining methadone maintenance is \$7.09 per hour for women and \$6.55 per hour for African-American clients. Being employed or married (with negative net effects through the dummy and interaction terms) makes the imputed value of travel time approximately zero.

The weighted average of the travel time estimates yields an average marginal value of travel time in obtaining methadone maintenance of \$5.49 per hour during 1999. The estimated average value of WTP for a reduction in travel time was \$7.32 per hour of travel time. The median wage rate for the employed individuals was \$10.04. Thus, the imputed marginal value of time is closer to WTP than to the wage rate.

This result suggests that using the wage rate as the proxy of time value in obtaining methadone maintenance produces time price effects that may overstate the true price effect. First, the wage rate is almost twice as high as the imputed marginal value of time. Second, the close association between the income and the wage rate produces income effects that may positively affect the treatment attendance rate and distort the time price effect. Based on the analysis presented above, the more appropriate measure of the value of time appears to be willingness to pay for a reduction in treatment time requirements.

This section has presented several comparisons of WTP and the wage rate. In limiting the sample to those who

Table 5
Estimates of the treatment attendance rate entering the time price in natural units

Variables	Parameters	T-Ratio
Intercept	0.9567	12.03***
African-American	–0.0088	–0.42
Women	0.0228	1.26
Employed	–0.0233	–1.08
Married	–0.0304	–1.36
Age	0.0005	0.13
Age squared	2.12E–06	0.05
Clinic in Macomb County (outside central city)	0.0950	5.25***
Clinic in Oakland County (outside central city)	0.0978	6.39***
Family income	–4.2E–07	–1.27
Weeks in treatment	–4.2E–05	–0.78
Previous treatment	0.0052	1.29
Money price	–0.0011	–1.55
Travel time	0.00026	0.99
Waiting time	–0.00016	1.89*
Race * Travel time	–0.00038	–1.50
Women * Travel time	–0.00039	1.72*
Employed * Travel time	0.00064	2.10**
married * Travel time	0.00053	1.79*
Observations		303
\hat{V}		\$5.49

* Statistic is significant at the 0.10 level (2-tailed).

** Statistic is significant at the 0.05 level (2-tailed).

*** Statistic is significant at the 0.01 level (2-tailed).

attend treatment, the results may be measuring the joint impact of the patients' preferences for attendance, as well as their value of time. Nonetheless, the results provide encouragement to examine further the use of WTP to explain treatment attendance.

4. Discussion

Identifying and measuring economic barriers to treatment is important for health services provision in general, and for methadone maintenance provision in particular. The study objective was to identify some of the major factors influencing treatment attendance among methadone maintenance clients. This study is the first to quantify the effects of time costs as barriers to treatment for people with opiate addiction. It has sought to measure the effects of money price and time price on clients' attendance.

Methadone maintenance has long been recognized to be highly effective in reducing drug use, as well as heroin-related death, disease and crime. By implication, it may reduce government expenditures devoted to those problems. However, for treatment to be effective, treatment compliance, implying regular attendance, is necessary for reducing social costs in terms of drug-related legal and medical expenses. Furthermore, regular attendance minimizes resource waste in terms of unproductive (in terms of giving treatment) clinic staff time and equipment utilization. From the societal point of view, savings achieved by minimizing clients' money and time prices to induce regular attendance may be cheaper than doing nothing and forgoing social savings related to reduced death, disease, and crime. Therefore, it is important to understand the role of money price and time price in treatment attendance for clients.

Measuring time value is a primary limitation in determining time effects in health care research. The wage rate, although commonly used, may not always equal the value of time (Cauley, 1987; Borisova and Goodman, 2003; Tilford, 1993). This study introduced an alternative specification of time price using WTP and compared it to the wage rate specification.

Both the wage rate and the WTP specifications of time price were tested in the treatment attendance model. When the wage rate was used as a proxy for value of time, the model produced ambiguous results with insignificant negative money price effect and insignificant positive time price effect on treatment attendance. In contrast, the WTP time price specification produced a significantly negative effect of time price on treatment attendance.

We also used indirect methods to compare WTP to the wage rate in valuing time. For different client subgroups the estimates derived using natural units of time were more consistent with WTP rather than with the wage rate.

We note study limitations in this initial examination of WTP. The results apply only to those who attended treatment and who responded to our questionnaire. Choosing to

enter treatment and to respond to the questionnaire may impart biases in our results, although it is unclear in what directions the biases will be.

The study suggests substantive policy considerations. First, methadone maintenance clients treat travel time and waiting time as costs that function as rationing devices for treatment attendance. Providers can use this information by inquiring of their patients about their personal time cost, reassuring patients that the costs are worthwhile, and providing alternative transportation or lowering the costs. For example, some funding sources will pay for bus fares.

Second, reducing time spent by methadone maintenance clients in obtaining treatment might improve attendance, which is a key factor to long-term outcomes. At the system level, most publicly funded referral systems try to make referrals to locations convenient for the patients. However, due to long treatment waiting lists these attempts are often unsuccessful. If a patient is not willing to travel to the location at which treatment is available, irrespective of convenience, other patients on the waiting list will be picked to take his or her place.

Other policy alternatives include mobile vans, the recently enacted office-based treatments (Fudala et al., 2003; Clark, 2003) or even the dispensing of medication at pharmacies. Such practices might significantly improve treatment attendance, and by inference, treatment success.

5. Definition of variables

African-American	1 if African-American; 0 otherwise
Age	Client's age in years
Attendance rate	Ratio of client's number of days attended to number of days required
Bus	1 if bus transportation; 0 otherwise
Employed	1 If employed; 0 otherwise
Family income	Gross yearly family income from all sources
Macomb (OAKLAND)	Suburban counties outside City of Detroit; value equals 1 if in Macomb or Oakland County, zero otherwise
Money price	Sum of treatment fees, related childcare costs, and transportation expenses
Time price	Treatment time requirements multiplied by the value of time
Time requirements	Sum of round-trip travel time to a clinic, and waiting time for methadone maintenance at the clinic
Treatment weeks	Number of weeks spent in treatment program by each client
Previous treatment	Number of times previously in treatment
Wage rate	Measured as a gross wage per hour for employed clients and as

reservation wage per hour for non-working clients

WTP Maximum amount per hour of travel an individual would be willing to pay to secure the reduction in travel time requirements

Travel mode Client's usual transportation used to travel to the treatment program; choices included bus, car, taxi, walk, bicycle, church van

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