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Economic and Clinical Covariates of Workers' Delayed Treatment Seeking Behavior in Bangladesh

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Abstract

Delayed treatment bears no good results other than shielding financial loss temporarily. But the long-term effects can be dangerous, both for recovery and budgetary burden. Still more than 72% of Bangladeshi workers take the risk of not rushing to healthcare centers. Almost 30% of them were found making delays beyond 3 days and around 21% wait more than 5 days. A discrete choice model in a dynamic setting found misperception about natural healing and a common dissatisfaction to healthcare service to influence workers' treatment seeking behavior in Bangladesh in addition to loss of income, cost of treatment and workplace rigidities. Weak health infrastructure and local constraints are also worsening such behavior.

ABBREVIATIONS

2SRI: 2-Stage Residual Inclusion; **IV**: Instrumental Variable; **BDT**: Bangladeshi Taka (Currency of Bangladesh)

INTRODUCTION

Self-determined delay in treatment seeking is still less addressed in developing countries where health insurances are almost non-existing and healthcare system suffers multidimensional inefficiencies. Prompt healthcare seeking can reduce treatment cost through early diagnosis, improved treatment compliance and short recovery period. Regardless of the consequences people are found delaying in seeking early treatment for poverty [1]; cost of treatment [2,3]; socio-economic status, gender, age, type of illness and quality of health care [4,5]; religious and traditional superstitions, cultural customs [6,7]; and as such. Non-unionized labors, job contracts with traditional medical allowancing instead of health insurance and inefficient health care system have eventually made out-of-pocket health expenditures common to almost all earning persons in Bangladesh. The weak insurance market works privately offering weaker schemes in health care. A feeling of losing real income may be leading working people to sub-optimal treatment seeking behavior. Besides, existing dual health care system, where the same physicians can operate privately side by side being engaged in public jobs [8], has resulted in inefficient service and widespread dissatisfaction among care seekers [9]. Health seeking behavior can be explained by the process models [4,7], as exercised by Conner and Norman [10,11], that emphasize the process of illness response. Alternatively, end point or pathway models in health, such as the health belief model and Anderson's health behavior model, describe utilization of the formal system and thereby evaluate health care seeking behavior. However, household income and cost of treatment overpower most of the factors determining health care demand when out-of-pocket health expenditures are obvious and when we are judging first time care seeking for any illness or injury. Also, quality of health care and illness type are vital in this regard. Rucker, Brennan, and Burstin [12] compared relative importance of various clinical and socioeconomic factors behind delay in seeking emergency care. This study aims to extend the discussion for delay in workers' illness and injuries from an economic point of view considering financial constraints and inefficiency in healthcare service in a dynamic optimization setting.

Absence of labor unions, exclusion of occupational health from primary healthcare and lack of government initiatives resulted in a poor occupational health in Bangladesh. Few formal workers receive negligible lump-sum medical allowances that cannot reduce out-of-pocket health expenditures to any great extent. This causes delay in treatment, under or informal treatment, and even no treatment with obvious long run effects. Workplace accidents were responsible for 1,292 workers' death in 2017 in Bangladesh (Bangladesh Occupational Safety, Health and environment foundation, OSHE, 2017). Workplace hazards like chemical, ergonomic and physical hazards are generated by workers' interactions with various chemical and biological agents, machines, extreme temperature, atmospheric pressure, load lifting, smoke, noise, stress, other workers and so on. Such accidents have cost lives of about 12,864 workers along with

11,767 workplace injuries in the ten-year period from 2008 to 2017 (OSHE, 2017). Lacks in safety measures, enforcement of national and international laws, and awareness are reasons for these deaths and injuries. Work related injuries and illness are not only causing individual losses but also incurring productivity drops in industries, threats to public health and wellbeing, and uncertainty to smooth supply.

Total health expenditures in Bangladesh have increased from $1.1 billion in 1997 to $4.1 billion in 2012 with a real annual growth rate of 8% and with an increase of out-of-pocket payment by households from 55.9% of these expenditures in 1997 to 63.3% in 2012 [13]. There are over 600 hospitals in the country, 16,438 community clinic and health centres and 30,000 satellite clinics for child and maternal healthcare (Centre for Research and Information, CRI, 2018, 'Bangladesh, towards better healthcare'). Public facilities are at the core of the pluralistic health care system in Bangladesh accommodating health workers, drug administration and community clinics in community level, health centers or complexes in union level, general hospitals and specialized hospitals in district level, and Post Graduate Medical Institutes with specialized healthcare centers as tertiary level healthcare [14]. The private for-profit health care facilities are urban oriented and rapidly increasing with growing inefficiency in public health care facilities (the number of registered private for-profit facilities increased from 1038 in 2007 to 5023 in 2017, [13]). Also, there are non-profit private health care providers, mainly operated by non-government organizations (NGO), along with village doctors, pharmacists and a wide variety of informal and unqualified providers. Lack of professionals, absence and lack of empathy among doctors and nurses, drug shortage, waiting time, travel hazard, etc. contributed to the low use of public health facilities [15,16]. Many studies showed use of unqualified health providers to be greater than the public facilities by many fold [17]. Also, medical tourism from Bangladesh is increasing rapidly. More than 2,00,000 Bangladeshis travelled India for medical purposes in 2017 and the number is rising very fast [18]. In this perspective this study explores why working people are neglecting their treatment needs in Bangladesh.

MATERIALS AND METHODS

Theoretical background

We assume that household utility, U, depends on consumption, C, and worker's illness and injuries, D (thus, U = U(C, D) with $U_c^{'} > 0$ and $U_D^{'} < 0$). Out-of-pocket treatment expenditures cause income losses that lead to lower consumption and hence, lower utility. The second element, D (worker's illness and injuries), also decreases household utility because of reduction in worker's marginal utility from consumption, [19] ($\frac{\partial^2 U(C,D)}{\partial C \partial D} < 0$).

Obviously worker's health deficit, F, will depend on his/her illness and injuries, D, in addition to overall health condition, X[1] (so, F = F(X, D) with $F_X^{'} < 0$ and $F_D^{'} > 0$). We are adopting standard assumptions for our intertemporal utility function, U, and health deficit function, F. We also assume that health deficits caused by worker's illness and injury, D, can be stopped by a health investment, h, [20]. Workers also derive utility from health investment for regaining marginal utility from consumption. Both these effects explain important influence of health investment (or treatment), h, on health deficit function, F($\frac{\partial F(X,D)}{\partial h} < 0$). We adopt the separability assumption between worker utility from consumption and from the cost of health protection. However, delay in treatment, d, always causes belated recovery or greater loss in marginal consumption, which can lead to higher cost of health protection. For simplicity we suppose d to be a downward shifter of the utility function. For instant treatment, i.e. for d → 0, treatment efficiency is the highest and it decreases with d, $\lim_{d\to\infty} \frac{\partial F(X,D)}{\partial h} \to -\infty$. The problem involves continuous choices of consumption accompanied by discrete treatment delay option to maximize worker's utility over a period, t = 0, ..., T, that can be presented as: $\max_{C,d} \sum_{t=0}^{T} \beta^t \left[U(C_t, D) - F(X, D) - \delta d_t\right]$. We measured d in days to visit health care after symptoms of illness or injury were revealed. Thus, d = 0 means instant care seeking, = 1 refers to first visit within 2 days of symptoms, = 3 indicates visit within 4 days and = 4 is for delay beyond 4 days. However, $\delta \in (0,1)$ can be assumed as disutility to work due to illness or injury. Obviously, a worker has to optimize the choices about consumption and treatment delay each period with respect to period specific financial constraints, $C_t \le M_t$, where M_t is the beginning of period t consumable resources or wealth. We can think of a simple wealth accumulation relationship defined by last period's savings ($M_{t-1} - C_{t-1}$), labor income (Y_{t-1}) and treatment cost (h_{t-1}). The Bellman solution produces optimal consumption rule, but the value function will not be globally concave in the presence of discrete choice [21]. Following Iskhakov et al. [22] we can predict a kink point at any value M = M_t where the worker takes the decision to treat. An analytical solution is suggested by Iskhakov et al. [22] that evaluates the value function at the kink point, the point that differentiates the value functions by $(\delta + h)^2$.

Beyond the above exposition we suppose workplace constraints and individual perceptions forcing treatment delays. Along with income, cost of treatment, and nature of illness or injury, there are influences from work related issues for which workers can show random treatment delay behavior. In the absence of labor union and health insurance workers suffer financial constraints to make out-of-pocket treatment expenditures, loss of income due to medical leave, and even difficulties in achieving leave permissions. Self-decided delay in seeking treatment not only signifies individual attitude towards health seeking behaviour but also captures contributions from collective learning and community impact on individual's cognitive development. The working peers can influence individual perceptions towards health care efficiency and cost.

[1] X includes worker's age, gender, education, history of medication, workplace safety and security related information, and as such.

2 V(No treatment) = f(U, X, D); V(Treatment) = f(U, X, h, δ). Following [17] we avoid idiosyncratic loss of life.

Data

Bangladesh household income and expenditure survey, 2016-17 (HIES 2016-17), the latest nationwide survey by Bangladesh Bureau of Statistics (BBS) using a stratified two-stage sample design and capturing data on household poverty, standard of living, health and education status, and so on from 46,080 households, is used in this study. Among 44,378 people who have reported to be working 7,602 reported that they were ill within last 30 days.

Econometric model

A multinomial logistic regression model is deployed to examine the factors responsible for self-determining delay in treatment seeking behaviour by working class comparing four distinct groups: immediate care seekers (who make visits loosing no time), seekers of treatment soon (within two days of symptom), late (within three to four days) and very late (more than four days). Empirical studies select the scale purposively in accordance to the research environment. Chen, Rizzo and Rodriguez [2] used delaying or forgoing needed treatment within a year as a dichotomous variable as they were examining its health effects among US civilian non-institutionalized population. Abuduxike et al. [1] used the same definition for a 5-year span for people of Northern Cyprus. In contrary, Romay-Barja et al. [23] defined delay whenever treatment was sought beyond 24 hours of symptoms as they were judging the case of Malaria in Equatorial Guinea. For urinary incontinence among Chinese women a longer delay was defined by Wu et al. [24] if there was no treatment seeking within 3 years. Rucker, Brennan and Burstin [12] used number of days symptoms were persisting to define four groups: 0 days, 1-2 days, 3-6 days, and ≥ 7 days as they were examining delay in seeking emergency care in five international hospitals.

The socio-demographic approach to healthcare utilization behavior, as addressed by Anderson [25], highlights its determinants as age, sex, education, occupation, ethnicity, socioeconomic status, and income [26, 27]. However, Bice, Eichhorn, and Fox [28] found income as a determining factor only among children and adults. Andersen and Benham [29] and Richardson [30] showed how financing method influence the lower-class healthcare. Particularly Andersen and Benham [29] shows positive impact of insurance coverage on healthcare demand by low-income groups. Working with the social-psychological approach Stoeckle, Zola and Davidson [31] showed how patient's knowledge and beliefs about his/her symptoms, expectations regarding health services and understanding about need for professional care influence his/her treatment seeking. Bloom and Wilson [32] also focused patient-practitioner relationships in explaining demand for healthcare. We define our objective function incorporating our theoretical understanding and empirical deduction as:

$$d_i = -\alpha\left(y_i - h_i\right) + \gamma X_i + \Omega q_{jj}$$

Intuitively workers are likely to delay treatment, d, up to a period beyond which his/her health condition, X[3], can no more tolerate the health deterioration given that they maximize the difference between return from investment in treatment and their loss of earnings in that period. If we assume that health investments completely revive worker illness or injury, then the treatment cost for a specific illness or injury, h_i, is required to regain worker i's daily earnings, y_i. The term, $(y_i - h_i)$, therefore, indicates the benefit from treatment. Age, level of education, gender and need for regular medication are the health indicators (X_i) included. Health, precisely health deficits, has close relationship to age [33] while education and income have significant influence on healthcare seeking [34]. Women and children are often having significant higher delay. Pre-existing health issues make people more concerned about their condition [2]. A set of person specific control variables like marital status, injury as a serious type of illness, respiratory disease as a long-term illness and whether he/she received treatment from a formal healthcare provider is considered in X. Chen, Rizzo, and Rodriguez [2] considered marital status of the patient as a control variable when they were examining influence of cost issues on treatment delays. Researches on cancer, urinary diseases and as such found more patients reporting in delayed manner due to different socioeconomic factors [35,24]. Rucker, Brennan, and Burstin [12] showed that treatment delay decreases significantly depending on patient's perception about seriousness. We have included whether a person is suffering any respiratory disease as this often requires a long-term treatment contrary to injuries that may force rushed visits to healthcare centers. Rucker, Brennan, and Burstin [12] also showed that patients make delay if they do not have a regular physician. A community variable q_{ij} identifies whether the worker i is working in a rural location (j = 1 if works in a rural area, 0 otherwise). People show differentiated behaviors towards healthcare seeking based on rural-urban differences. First, healthcare facilities are mainly urban centered. Second, physician absenteeism, faulty facilities and deficiency of treatment tools and medicine are common in rural care centers.

Endogeneity issues

The supply side of health care service suffers a great degree of asymmetric information as physicians solely determine the amount of care needed. However, this could be a possible source of biasness in any attempts of examining health care demand in Bangladesh. First, doctors' decisions about medical care are often influenced by the socioeconomic status of their patients. Second, there can be a general mistrust about the efficiency of doctor's opinion (both cost and outcome) among patients. Bangladesh records high and fast accelerating health tourisms. Also, wealthy people rarely trust the public health care service. Thus, the interaction between health seeking behaviour and benefit from treatment is likely to be influenced by patient's perception about healthcare service, workplace dynamics and community attitude towards health. Because we have included only the working people the health behavior of co-workers should be the strongest [36]. According to Rucker, Brennan, and Burstin [12] personal belief about seriousness of a disease, perception about need for treatment and confidence on healthcare service are key factors for treatment delay. Not only that peer effects contribute majorly in constructing individual perception but also influence different workplace constraints that may defer treatment. The problem is that in one hand the ability to perceive and the earning capability are closely related and in the other information from the peers

3 We do not have workplace safety and security data that often reduce delay in treatment.

about healthcare providers' quality, care process, drug, and as such have impact on treatment cost. In order to address this likely endogeneity in our model where the dependent variable is categorical, we designed a two-stage residual inclusion (2SRI) regression method following Terza, Basu, and Rathouz [37]. IV Probit and Bivariate Probit are two popular methods for correcting endogeneity in probabilistic models, the first one works better when endogenous variable is continuous and the second one is applied to models without proper instrument. However, none of these methods are applicable to models with categorical dependent variable. 2SRI and Bivariate Probit were compared in Galárraga et al. [3], finding satisfactory results from both. We define the auxiliary function as:

Treatment benefit = g(age, gender, level of education, locality, W) + X_U

where W is the instrument(s) and X_U is the residual. The outcome regression will be:

d = f(Treatment benefit, X, q, X_U) + e

Galárraga et al. [3] used an asset index as a proxy for household wealth and an area specific deprivation index to control well-being at the local level when they were examining appropriateness of health insurance among Mexican poor. We have used two variables: a dummy '***test***' that takes the value 1 if the worker had to go through any pathological laboratory test during treatment and 0 otherwise; and a continuous variable '***travel time***' that measures the travel time to the healthcare provider. Medical check-up expresses the severity of the problem along with worker's awareness. However, tests are done after first visit to physician or healthcare provider. Travel time expresses the transportation constraint and thereby shows worker's unwillingness to visit healthcare provider. Unfortunately, the auxiliary function can be a secondary source of endogeneity due to its resemblance to wage function. It has a Mincer [38] type wage – human capital gradient that suffers unknown ability, household optimization and measurement impacts [39]. Including proxy measures through education of parents or spouses, physical health status, nutrition, and so on [40,41] can be one remedy of this problem. Parental education, occupation, family size, distance to school, ownership of assets and as such are used as instruments by several researchers to address endogeneity problem through instrumental regression technique [42]. We have used current market value of residence as a proxy variable for level of education based on both informal method of R-squared criteria and a penalized likelihood test [43-48]. However, because of limited options we only had to compare the selected proxy against parental education.

Variable description

More than 72% of Bangladeshi ill workers take the risk of not rushing to healthcare centers. Almost 30% of them were found making delays beyond 3 days and around 21% wait more than 5 days. Among 7602 workers who have received treatment due to illness or injury the average daily income was about BDT[2] 319 and cost of treatment was about BDT 825. Their average age was more than 29 years, more than 52% of them were male, more than 60% were married and more than 42% required any medicine regularly. 457 of these workers were suffering from any respiratory diseases while 212 were injured. More than 36% workers received treatment from formal healthcare center, more than 43% had pathological laboratory tests and more than 64% were working in rural areas. More than 11% could not reach any healthcare within 1 hour. Around 43% workers were illiterate, 16% had received primary education and 30% had completed secondary school. Most of the workers live in cheap houses. About 2177 lived in houses worth less than BDT 100000.

1 US $ = 77.47 BDT (2016)

RESULTS AND DISCUSSION

Table 1 presents the average marginal effects after 2SRI for our multinomial logistic regression model. As per the optimization rule for our discrete dynamic model the benefit from treatment appears to be very close to zero in each period. It is highly significant for workers who seek healthcare immediately, soon or very late. Workers may find it beneficial, either for regaining income or for cost of treatment, to choose the 'soon' or 'vary late' options without choosing 'late'. Aged workers are more reluctant to visit healthcare provider early. Rucker, Brennan and Burstin [12] showed an increased urge for healthcare only among old people (beyond 65 years). However, the impact of age on healthcare delay is minimal. Current market value of the residence, which is the proxy for the level of worker's education, shows highly significant desire for educated people to wait a little before seeking healthcare. If all workers were educated than there would be 1 percent more demand for healthcare within first two days of any illness symptoms. Simultaneously educated people are reluctant to make too late to visit physician for medical advice. Male workers are not interested in quick treatment. This may be due to their work responsibilities or perception about natural healing as mentioned by Rucker, Brennan and Burstin [12]. This gender biasness also explains extended household responsibilities for female workers. Workers needing regular medication are more likely to be very late in seeking treatment. This can be an indication of dissatisfaction of care takers. Alternatively, this can be due to their desire to get treated by the regular physician [12].

If all the workers were married there would be 5 percent more chances that they would immediately go to a healthcare provider following any illness symptom. This reflects the impact of responsibility towards family. The married people dislike making delay in treatment. Our two illness type control variables provide strong support to our model. Injured working people are highly motivated to visit healthcare provider immediately. If all ill workers were injured, then the immediate healthcare seeking would rise by 23 percent. Also injured workers will never agree to be very late in seeking healthcare. In contrary, workers suffering respiratory diseases try their best to wait for natural healing. Bangladesh being a tropical country, people are habituated to cold, cough, sore throat, asthma, and other respiratory diseases. Thus, it is not unusual that workers remain reluctant to visit physicians for any respiratory disease symptoms. Formal treatment takes time. It can be that formal healthcare is suffering serious service shortage in Bangladesh. It can also be true that workers try other informal and rudimentary methods or wait for natural healing before seeking formal healthcare.

Table 1: Average Marginal Effects after 2SRI for Multinomial Logistic Regression on Self Determined Delay in treatment.

Health care seeking:	Immediately	Soon	Late	Very late
Benefit from treatment (BDT)	-5.5E-05***	9.54E-05***	9.14E-06	-4.9E-05***
	(9.28E-06)	(1.03E-05)	(6.48E-06)	(5.76E-06)
Age (years)	-1.9E-03***	2.3E-04	8.9E-04***	7.3E-04***
	(3.9E-04)	(4.02E-04)	(2.3E-04)	(2.3E-04)
Current market value of house (BDT, proxy for education)	-2.9E-03	0.01***	-0.01*	-0.01*
	(4.7E-03)	(4.7E-03)	(2.9E-03)	(3.06E-03)
Gender (= 1 if male, 0 otherwise)	-0.03***	3.6E-03	0.02**	0.01*
	(0.01)	(0.01)	(0.01)	(0.01)
Need regular medication (= 1 yes, 0 otherwise)	0.02	-0.04***	4.4E-03	0.01*
	(0.01)	(0.01)	(0.01)	(0.01)
Marital Status (= 1 if married, 0 otherwise)	0.05***	0.01	-0.03**	-0.03***
	(0.01)	(0.02)	(0.01)	(0.01)
Illness type: Injury (= 1 if injured, 0 otherwise)	0.23***	-0.16***	4.3E-03	-0.08**
	(0.03)	(0.04)	(0.02)	(0.03)
Illness type: Respiratory diseases (= 1 if resp. ill, 0 otherwise)	-0.02	-0.01	-0.01	0.04***
	(0.02)	(0.03)	(0.02)	(0.01)
Treated by formal care provider (= 1 yes, 0 = otherwise)	-0.06***	-0.07***	0.03***	0.10***
	(0.01)	(0.01)	(0.01)	(0.01)
Location dummy (= 1 if rural, 0 otherwise)	-0.03**	-0.01	0.01	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)
$\widehat{\widehat{X}}_u$	4.03E-05***	-6.9E-05***	-1.3E-05**	4.23E-05***
	(9.52E-06)	(1.08E-05)	(6.65E-06)	(5.98E-06)

*, ** & *** represents level of significance at 10%, 5% & 1% respectively. Robust standard errors are in parenthesis.

Rural people are usually very late in seeking healthcare. A similar unwillingness to immediate treatment supports a strict division between rural and urban areas of Bangladesh. May be due to supply shortage or private sector concentration in urban area, there is a gap between infrastructural development between rural and urban areas. This is causing the differences in treatment delay behaviour.

The endogeneity incorporating error term is highly significant but having a very dismal value. Relevant Durbin–Wu–Hausman F-test suggests the significant presence of endongeneity in our model at the one percent level (Table 1).

The probability of visiting healthcare favors soon in comparison to all other category if benefit of treatment is considered. Same is true for house value, which is the proxy for education. Probability of visiting late or very late favors aged workers slightly, about 1% more than visiting soon. Male workers are 17% more likely to seek healthcare late than seeking soon. They also have 11% more chances of becoming very late in seeking treatment compared to doing it soon. Workers receiving regular medication are more than 25% probable to visit healthcare centers very late compared to going soon.

A married worker has 14% more probability to visit a healthcare center immediately rather than making delay, whereas he/she has about 25% less chances to visit very late compared to soon. The chances of receiving formal treatment is almost 57% higher if a worker makes a late visit rather than going soon to a healthcare center. The chances are almost double than soon if a worker turns up for formal treatment very late. A worker having injury is more than twice likely to immediately turning up to any healthcare facility than soon, but if having a respiratory disease than the probability to become very late is 44% more than the probability of going soon. Workers from rural areas are 40% more likely to be very late in visiting any healthcare center than going soon. They have 13% probability to do it lately rather than soon.

We have checked our results using eye problems as a replacement of respiratory diseases and found similar results. However, replacing injuries with fever did not yield significant results for illness controls. Sargan test for over-identification and Anderson LR test for IV relevance are significant. We also performed IV Probit regression finding minimal changes in results, e.g., benefit of treatment also became significant in late option, regular treatment became significant in both immediate and very late options, and as such. The instrumental variable test rejects the exogeneity in the model. We found that a multinomial

logistic regression ignoring the endogeneity problem over emphasizes the benefit of treatment.

CONCLUSION

Work related injury and illness is a core reason for workers' misery, production inefficiency, emergency health-care demand, household poverty and as such. Unfortunately, still a huge number of workers are requiring medical help due to work related injuries and illnesses every day. For more to concern, a great part of these ill or injured workers do not get proper treatment partly because of delaying to visit any healthcare center. Workers in Bangladesh often delay their treatment as they try to optimize their benefit considering out-of-pocket healthcare expenditures and earnings. Though workers prefer to have healthcare suggestions within one or two days their financial and work-related barriers may cause greater delays. A general reluctance to visit healthcare immediately reflects workplace constraints whereas confidence on the healthcare service is also questionable. Government should step forward to initiate policies like health insurance for earners, workplace health safety provisions, transportation facilities, treatment subsidies, better monitoring over health services and as such to encourage quick visits to healthcare centers.

Workers have to wait long periods if they desire formal treatment or want to see a regular doctor. Moreover, workers from rural areas face really long periods before receiving any healthcare. Hence, the government should take intensive plans to improve health infrastructure and increase proper healthcare service all over the country.

Workers' misperception about natural healing and/or misunderstanding symptoms may cause a long delay threatening their recovery. Education provides better signals to workers. Public policies helping educational attainments and health awareness should be supportive to prevent treatment delay.

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