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Pre-hospital Service for Victims of Road Traffic Accidents

Preliminary Evaluation and Economic Policy Implications *

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INTRODUCTION

Road traffic accidents in Thailand, as is the case in some other developing countries, are on an alarming rising trend and pose a major loss for society. Statistics indicate that: a) the fatality rate from road traffic accidents increased more than fourfold during the past three decades; b) the number of fatalities caused by traffic accidents were 15,176 (1994 figure), and the number of injuries might be in the vicinity of 200,000[1]; c) the economic loss, estimated in terms of loss in human capital and the costs of cure and care, is huge, 2-3 percent of GDP (in 1993, the loss value amounted to over 74 billion baht); and d) road traffic accidents have already posed a heavy burden for hospital care. Traffic accidents are identified by Professor Vichitr Bunyahotara, former director of the Office for Accident Prevention, as one of the "development diseases" that are newly emerged in the present Thai society.

Policy responses to curb traffic accidents have been initiated on many fronts. These include tightening law enforcement, such as deterrence of addicted and drunk drivers, more police patrols at major road intersections, etc. A recent development in the area of health management is the initiation of pre-hospital care for victims of road traffic accidents currently undertaken by a few of the major hospitals. This first of its kind in Thailand, this program was started in Khon Kaen by the Khon Kaen Hospital in early 1993. In Bangkok, three major hospitals (two public hospitals and one private hospital) launched pre-hospital services at the end of 1994. These are Rajavithi Hospital, Vajira Hospital and Bangkok Hospital. Pre-hospital programs also have their costs. From the viewpoint of policy management, it is natural to query: i) Are the benefits from this program worth the costs?; ii) How much is the social cost and who finally bears this burden? Should these programs be financially supported, partly or wholly, by the public sector? iii) As these programs are still in an early or 'pilot' stage and some are operating on a limited scale, should they be extended to cover Greater Bangkok? Should similar programs be operated in other major cities?

FATALITY AND INJURY FROM TRAFFIC ACCIDENT

The rise in road traffic accidents in Thailand surprises no one. There are many contributing factors, such as a rise in the number of vehicles per capita, higher demand for transport in terms of kilometers traveled, and higher road congestion. The true causes of the rise in traffic accidents are, however, difficult to pinpoint. It is not necessarily the case that higher income leads to higher demand for transport and, thus, greater chance of committing traffic accidents; in other words, development is not necessarily the cause of traffic fatalities and injuries, as can be witnessed in some advanced countries where, although the number of vehicles per capita continues to rise, the fatility rates have decreased or remained stable.

Table 1 highlights road traffic accidents for the Whole Kingdom and in Bangkok, with special reference to injury and deaths.

From Table 1, one may observe that: First, there were 102,610 cases of road traffic accidents in the whole country in 1994, averaging 281 cases per day; in Bangkok alone there were 72,359 cases, averaging 198 cases per day. Traffic accidents seem to be heavily concentrated in Bangkok. Second, the number of deaths from road traffic accidents was 15,176 persons in 1994, averaging 41.6 persons per day or 1.7

person every hour. Third, damages from traffic accidents are rising at an astonishingly rapid rates. The rates of growth in 1994 over 1993 were 20.9 percent in terms of the number of accident cases, 71.9 percent in terms of injuries, and 59.8 percent in terms of deaths.

Table 2 summarizes traffic statistics for Bangkok for the first seven months of 1995 (January to July).

From Table 2, one may observe that: A) Each month there were 5,227 cases of road traffic accidents in Bangkok (this figure excludes traffic accidents in suburban Bangkok) involving 8,806 vehicles. These figures average 174 accident cases per day involving 294 vehicles. B) About 261 people were severely injured from road traffic accidents each month and 107 died. These figures average, on a daily basis, 87 severely injured and 3.6 dead. C) 1,451 people incurred minor injury from these accidents, averaging 48 persons per day.

RESCUE AND PRE-HOSPITAL CARE PROGRAMS: KHON KAEN AND BANGKOK EXPERIENCES

Khon Kaen Hospital

The first pre-hospital care program in Thailand was undertaken in Khon Kaen municipality by Khon Kaen Hospital in March 1993. Based on a study from the trauma registry, it was concluded that among the dead from traffic accidents: a) 50 percent of the traffic victims were severely injured and died almost immediately, b) 35 percent died one to two hours after the accidents, and c) 15 percent died after being treated in hospital.[2] The rationale for pre-hospital care is that immediate and proper medical treatment might reduce the number of fatalities, especially among groups b) and c). It was also found that about 90 percent of the traffic victims were sent to hospital by bystanders at the scene of the accidents, people without medical training; hence, the victims did not receive proper first-aids treatment until they reached the hospital.

Rajavithi Hospital

Rajavithi Hospital started its pre-hospital care as a pilot program in November 1994 and began the full program in February 1995. The program, which is called "Narenthon", serves four districts in central Bangkok—Rajavithi, Phyathai, Huay Kwang, and part of Dusit. The objectives of the program include: a) sending a rescue team to the accident site within 20 minutes of the traffic accident, b) safely transferring the traffic accident victims to hospitals in accordance with medical standards, and c) reducing injury and fatality rates by at least 10 percent. The rescue team consists of a medical doctor, nurse, emergency medical technician, and driver, as well as a fully equipped ambulance.

At its preparatory stage, the Narenthon program provided three training courses for technicians, nurses and medical doctors. A training course for emergency medical technicians was given to 30 personnel (15 from the Po-Tek-Tung Foundation and 15 from the Ruamkatanyu Foundation).

Vajira Hospital

The program for pre-hospital care at Vajira Hospital is entitled "Surgio Medical Ambulance and Rescue Team" or SMART. It was started as a pilot program on October 10, 1994 and officially began on December 10, 1994 and is responsible for four districts—Dusit, Bangsue, Pranakorn, and Bang Plad. In addition to traffic accident training, SMART has trained its personnel in disaster relief operations. A SMART rescue consists of a medical doctor, three technicians, three support staff from the Po-Tek-Tung Foundation, and two drivers. The program has established communication links with five radio centers—Panfa Center, Rama Center, Krung Thon Center, Bangkok Radio Center and Vajira Center—and is linked by radio with 16 police stations.

Bangkok Hospital

Bangkok Hospital is a privately operated hospital located in the eastern part of Bangkok. In mid-1993, the

management of Bangkok Hospital initiated a new idea: using a motorcycle, fully equipped with medical instruments and first-aid tools, accompanied by an experienced nurse and assistant, to provide first-aid treatment at an accident site. The motorcycle was considered to be the best means of reaching traffic accident sites quickly with a minimum lapse of time. After receiving first-aid treatment, the victim would be transferred to the hospital by an ambulance van.

In providing its pre-hospital service, the Bangkok Hospital has cooperated with the Jor Sor 100 Radio Station, well-known among Bangkok's motorists for its traffic reports and owned by the Pacific Corporation. The Bangkok Hospital has also developed a radio center within the hospital. Bangkok Hospital's rescue team comprises experienced nurses and emergency medical technicians. The rescue team is equipped with a portable-monitoring device which allows a patient's medical information obtained from examination at the accident site to be transmitted for diagnosis to the hospital's diagnostic center while the rescue team works at the accident site. Bangkok Hospital also has plans to mobilize traffic victims by helicopter in the near future. In mid-1995 Bangkok Hospital signed a contract with Sri Chang Flying Company to rent a helicopter for emergency cases.

Po-Tek-Tung Foundation

The Po-Tek-Tung Foundation is one of the best-known, non-profit private organizations in Thailand. Over its long history, the Foundation has expanded its role and scope of operation. At present, the Foundation operates a hospital (Hua Chiew Hospital) and a university (Hua Chiew Chalermprakiat), in addition to its social welfare and disaster relief operations. The Po-Tek-Tung Foundation has a large number of personnel, salaried staff and volunteers. The Foundation has sent its personnel to training courses organized by Rajvithi and Vajira hospitals and the Nitivech Institute, which is under the Police Department.

Ruam Katanyu Foundation

Founded in 1970, Ruam Katanyu Foundation is another private, non-profit organization that has cooperated with the Rajvithi Hospital's pre-hospital care program. The Foundation has over 80 staff and about 30 pick-up trucks available for disaster relief operations and general use.

COST ESTIMATE AND COST-EFFECTIVENESS OF THE PROGRAMS

Overhead and Operating Costs of Pre-hospital Programs

Cost-effectiveness is a measure of cost in relation to the program's performance or outcome (the number of patients treated, the number of lives saved, etc.) The cost of pre-hospital care programs may be classified into two components.

A. Overhead cost

Overhead cost, in this case study, refers to expenditures on ambulance and medical equipment and the initial cost to train personnel. As this cost component is fixed, the average fixed cost decreases as the scale of operation increases. The average fixed cost is, usually, not a deciding factor in economic decision making. Total overhead cost for all three pre-hospital programs amounted to 19.64 million baht

B. Operating cost (or variable cost)

The operating cost for pre-hospital care programs is largely determined in terms of compensation for personnel (doctors, nurses, technicians, drivers, and support staff), cost of gasoline, ambulance maintenance cost, and medical expense and treatment cost for traffic victims. The total operating cost for the three programs amounted to 15.7 million baht per year, or 1.3 million baht per month.

Cost-effectiveness

Cost-effectiveness analysis is a measure of cost in relation to performance and outcome indicators. It is useful for policy decision making as a mechanism for comparing efforts addressed to different types of disease and population. On a monthly basis, the average variable cost appears to be about 6,470 baht per serviced victim. This cost estimate can be compared with the future costs to assess the efficiency of pre-hospital service over time, or to formulate a comparison between operating units (hospitals). It should be noted that these cost estimates are crude and preliminary. We tend to believe that these costs are underestimated due to under-compensations for doctors, nurses and other rescue team staff. In the future, more serious effort should be given to comparing cost with outcome indices, such as the number of lives saved, a reduction in the number of disabled persons from traffic accidents, etc.

Cost and Risk Sharing

Traffic accidents pose a high cost for society in terms of fatality, disabled people, medical expenses, time cost, and the social cost implicit in a large number of public workers in the areas of health, police, justice, etc. These costs are *ex post*. There is also *ex ante* cost and risk to all road users (drivers, passengers and pedestrians), as they are, potentially, exposed to risk of life and limb caused by traffic accidents. Theoretically, it is conceivable that the cost of pre-hospital care may be shared among all road users as a kind of insurance to ensure that all victims receive prompt assistance from rescue teams with adequate first-aid training following an accident. There are alternative ways of cost sharing. The simplest scheme is to divide the cost of pre-hospital care equally among the population in Bangkok (or Khon Kaen). Alternative schemes are: a) the cost is divided equally among vehicle owners in the city, b) the cost is divided equally among all vehicle drivers. The following statistics summarize cost sharing under different rules:

- cost sharing equally among all of Bangkok's population
  = 2.82 Baht / person /year
- cost sharing equally among vehicle owners in Bangkok
  = 5.31 Baht /vehicle / year
- cost sharing equally among Bangkokian drivers
  = 9.51 Baht / driver / year

Note: Only operating cost is taken into account, fixed cost is not included.

POLICY IMPLICATIONS

All pre-hospital care programs in Thailand are new and they are likely to be adapted in the future. There are at least three policy issues of interest—financing, sustainability, and new methods to improve service quality.

Alternative financing schemes

The cost of pre-hospital care is, at present, financed through cross-subsidization within a hospital. This may be inappropriate financing. The author argues that there may be better ways of financing, such as:

A. Financing from local taxation.

Justification: We may assume that all Bangkok residents are benefiting from these programs; hence, it is reasonable that all should share in the cost. Financing from local taxes seems to be an obvious method.

B. Financing from vehicle owners.

Justification: i) Vehicles are the potential source of traffic accidents and ii) the vehicle owners are, generally speaking, more affluent than people who do not own vehicles. There are two ways of collecting revenue. First, by imposing cost sharing from the annual license fee collected by the Department of Transportation for local governments. Second, financing from insurance premiums collected by insurance companies according to the Traffic Victim Protection Act, B.E. 2535. This premium is an insurance against the risk of

traffic accidents with the prime objective being to protect traffic victims, be they passengers, pedestrians or drivers.

C. Financing from drivers.

Justification: Traffic accidents, by and large, are the result of traffic violations or improper driving behavior such as speeding, tailgating, running red lights, etc. Drivers as a group should be responsible for traffic accidents and, thus, should pay. The cost burden of pre-hospital services could be shared among drivers, and the payment could be made through driver's license fees in such a way that risky drivers would pay a higher fee than average.

D. A mixture of cost-sharing schemes.

In the author's opinion, this may be the most reasonable and practical means of financing. It may be too early to suggest an exact formula for cost sharing. We can offer only an example, say, 30 percent of the cost burden is borne by vehicle owners (in practical terms—from vehicle insurance premiums already collected by insurance companies); 30 percent from drivers (from license fees); and the remaining 40 percent financed from local government grants and charitable donations.

Improvement in Service Quality

The demand for health care is normally income-elastic, in other words, higher incomes lead to higher demands for higher quality services, which results in a more-than-proportionate health care expense. It is natural to expect that Bangkok residents will demand more or better health service. Among the most immediate tasks toward improving a pre-hospital care are: a) a centralized telecommunications center to coordinate among the hospitals so that repetition in rescue missions can be avoided or minimized; b) more participation from other hospitals, i.e., pre-hospital centers should be operated in other hospitals so that each program is operating within a limited zone; accordingly, the travel distance and travel time before reaching a victim can be reduced; and c) more and upgraded training programs for emergency medical technicians.

Sustainability of the Pre-hospital Program

The cost estimates as earlier reported are somewhat underestimated mainly because of underpayment of hospital personnel. To assure sustainability of the pre-hospital care programs and the quality of service, doctors, nurses, technicians and support staff who work in the program should be paid, at least, according to their market wage.

POLICY ISSUES

Preventive policy is best simply because the damage from traffic accidents, in both economic and social terms, is too high. Many policy actions can be simultaneously taken from many fronts to reduce the number traffic accidents and their severity, but each policy has its cost as well as its benefit. Because resources are limited, it is economically wise to adopt those policies which yield the greatest benefits at the least cost.

Some Preventive Measures

From previous research and experience in advanced countries, the most cited major cause of traffic accidents is drinking and driving, the leading cause of motor vehicle accidents in the United States (Jewell and Brown 1995).[3] Several studies show that both the severity of punishment and the resources devoted to detection and conviction reduce motor vehicle accidents. Chaloupka et al. (1993) and Saffer and Chaloupka (1989) reported that US states with preliminary breathalyzer laws had significantly lower motor vehicle fatalities. Coate and Grossman (1988) and Saffer and Grossman (1987) reported lower motor vehicle fatalities in US states with higher alcohol taxes and higher minimum drinking ages. Jewell and

Brown (1995) found that restriction in the number of alcohol vendors was an effective policy tool in reducing drinking and driving behavior. Murray et al. (1993) found that anti-drinking and driving advertising campaigns significantly reduced traffic accidents.

In brief, it is time to devote more effort in Thai society for policies concerning:

- using seat belts
- drunk driving
- minimum legal drinking ages
- alcohol taxes
- advertising campaigns against youthful male drinking and driving behavior
- speed limit controls and deterences to speeding

RESEARCH AGENDA

Good policy formation requires information and supportive research. The author suggests that more concerted efforts should be given to research in the following topics:

- Improvement in traffic accident data collection
- A longitudinal statistics study of traffic victims
- Statistical analysis of traffic accidents
- Economic loss from traffic accidents

CONCLUDING REMARKS

Pre-hospital service for road traffic victims is an innovation in public health management to mitigate damage in terms of fatalities and injuries. Presently, these programs are provided free of charge to victims. The cost of pre-hospital care is financed mainly by cross-subsidization within hospitals. To ensure program sustainability, all salaried personnel involved should be paid at their market wage. The cross-subsidization within hospitals is hardly justifiable and seems an inappropriate way of financing. Alternative schemes of financing are discussed in this paper. Policy issues discussed in this paper include: an improvement in the system to coordinate between hospitals to minimize duplication as much as possible; more hospitals should participate so that the responsible area for each hospital is not so wide and, thus, time lapse in transferring victims to hospitals is reduced; deterrence of drunk driving, higher penalties for traffic violators, advertising campaigns against drunk driving, etc. Finally, the paper suggests that more concerted efforts and resources should be given to traffic accident research to support policy decision making.

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