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Comparative analysis of three prehospital emergency medical services organizations in India and Pakistan

V. Sriram ^{a,*}, G. Gururaj ^{b,e}, J.A. Razzak ^{c,f}, R. Naseer ^{d,g}, A.A. Hyder ^{a,h}

^a Johns Hopkins Bloomberg School of Public Health, 615 N. Wolfe St, Baltimore, MD 21205, USA

^b Department of Epidemiology and Centre for Public Health, World Health Organization Collaborating Centre for Injury Prevention and Safety Promotion, National Institute of Mental Health and Neuro Sciences, Bengaluru, India

^c Department of Emergency Medicine, Johns Hopkins School of Medicine, 5801 Smith Ave, Ste 202, Baltimore, MD 21209, USA

^d Pakistan Red Crescent Society, Islamabad, Pakistan

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ABSTRACT

Objectives: Strengthened emergency medical services (EMS) are urgently required in South Asia to reduce needless death and disability. Several EMS models have been introduced in India and Pakistan, and research on these models can facilitate improvements to EMS in the region. Our objective was to conduct a cross-case comparative analysis of three EMS organizations in India and Pakistan – GVK EMRI, Aman Foundation and Rescue 1122 – in order to draw out similarities and differences in their models.

Study design: Case study methodology was used to systematically explore the organizational models of GVK EMRI (Karnataka, India), Aman Foundation (Karachi, Pakistan), and Rescue 1122 (Punjab, Pakistan).

Methods: Qualitative methods – interviews, document review and non-participant observation – were utilized, and using a process of constant comparison, data were analysed across cases according to the WHO health system ‘building blocks’.

Results: Emergent themes under each health system ‘building block’ of service delivery, health workforce, medical products and technology, health information systems, leadership and governance, and financing were described. Cross-cutting issues not applicable to any single building block were further identified.

Conclusions: This cross-case comparison, the first of its kind in low- and middle-income countries, highlights key innovations and lessons, and areas of further research across EMS organizations in India, Pakistan and other resource-poor settings.

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* Corresponding author. Tel.: +1 847 275 3655.

E-mail addresses: vsriram1@jhu.edu (V. Sriram), epiguru@yahoo.com (G. Gururaj), junaidd.razzak@hopkins.edu (J.A. Razzak), drnaseer@hotmail.com (R. Naseer), ahyder1@jhu.edu (A.A. Hyder).

^e Tel.: +91 80 26995200.

^f Tel.: +1 410 955 2280.

^g Tel.: +92 42 37421122.

^h Tel.: +1 410 502 8947.

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Introduction

Prehospital care is an essential component in the continuum of emergency medical services (EMS).¹ Yet, the formal availability of these services is limited in low- and middle-income countries (LMICs).^{2–4} With growing morbidity and mortality caused by non-communicable diseases and injuries in LMICs, EMS, are urgently required in order to prevent needless death and disability.^{5,6} Prehospital care is essential to achieving this goal, as highlighted in a recent systematic review which showed that the availability of prehospital trauma systems in LMICs resulted in a 25% reduction in trauma-related mortality.⁷

Many South Asian countries, including India and Pakistan, are among those LMICs where systems of EMS are still fragmented, uncoordinated, and of poor quality.^{8–11} In India, prehospital services are delivered by a range of providers from public, for-profit and non-profit sectors, with care ranging from extremely basic patient transport to highly specialized, mobile coronary care units.^{9,12,13} Similarly in Pakistan, a range of public, for-profit and non-profit EMS providers deliver pre-hospital care, with the landscape of actors differing by province.^{8,14,15} Karachi alone has a minimum of five private and charitable organizations currently delivering prehospital EMS; however, most focus on patient transportation, and none have been evaluated for impact.⁸

The challenges these countries face in establishing accessible, affordable and high-quality systems of EMS are considerable. Despite these difficulties, several models of EMS have been introduced in India and Pakistan in both public and private sectors. Given the shared characteristics of these two countries, such as high population densities, wide socio-economic disparities, weak infrastructure and mixed health systems, we believe that there is considerable opportunity for shared learning and reflection.¹⁶ EMS is now the focus of increasing attention and investment, and the lessons learnt from these different models of EMS provision could be highly relevant and applicable to stakeholders looking to establish or strengthen EMS in the region. Utilizing data from three qualitative case studies of EMS organizations in India and Pakistan, the objective of this paper is to provide a cross-sectoral comparative analysis of these EMS providers, in order to draw out key similarities and differences in these approaches, and to use the findings to present preliminary lessons for EMS stakeholders working in LMICs.

Methods

We conducted three case studies of EMS providers from different sectors, in India and Pakistan – Rescue 1122 in Punjab Province, Pakistan; GVK Emergency Management and Research Institute (GVK EMRI) in Karnataka, India; and Aman Foundation in Karachi, Pakistan. Case study methodology was utilized to systematically explore each of the models, given its suitability in comprehensively exploring complex social phenomena and real-life events.¹⁷ We

designed the study as a series of single, holistic cases, and each case was selected due to their unique nature within their setting. We selected GVK EMRI due to its partnership with the Government of Karnataka in India through a public-private partnership; Aman Foundation due to its position as a private sector provider of EMS in a fragmented emergency care market in Karachi, Pakistan; and Rescue 1122 given its standing as a government-funded, public sector provider of EMS across Punjab Province in Pakistan. Our studies focused on each of the cities in which the organizations were based. All three cases were also chosen due to pre-existing relationships with the Johns Hopkins International Injury Research Unit (www.jhsph.edu/IIRU) at the Johns Hopkins Bloomberg School of Public Health. To the best of our knowledge, this is the first application of this methodology to prehospital EMS organizations in South Asia. Methodological details of each case study are provided in forthcoming publications. This research was classified as exempt from ethical review by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board.

The unit of analysis was the organization, and data collection was guided by the Framework for Action for strengthening health systems proposed by the World Health Organization.¹⁸ According to this framework (Fig. 1), health systems can be understood through the lens of six, interconnected components or ‘building blocks’ – service delivery, human resources, financing, supply chain, information systems, and leadership and governance.¹⁸ We applied this framework to all three cases, and qualitative methods were used to collect data on each of the components through in-person site visits between June and July 2013 that lasted between four and six working days, based out of the headquarters of each site. We used three forms of data collection – in-depth interviews using a semi-structured interview guide, document review and non-participant observation. Secondary data was also provided by each of the organizations regarding key indicators. Detailed descriptions of the methods for each case are found in forthcoming publications.

We deductively categorized relevant data and themes by the appropriate building block.^{19,20} Memos on fieldwork were regularly shared, reviewed and discussed by several authors.²¹ We also used respondent validation (member checking) by sharing initial drafts of the results with the organizations involved, as well as in a workshop conducted with leaders of Aman Foundation and Rescue 1122.

We developed a table to facilitate the comparisons by determining relevant categories for each building block and analysing these categories across the organizations. We focused on the following three areas in our analysis – 1) similarities between the organizations; 2) differences in their approaches; and 3) research gaps when taken in context of the wider literature.¹⁷ Following a process of constant comparison, we identified key themes around areas of similarity and difference across the organizations.²² Finally, we prepared additional memos outlining these ideas, and utilized further peer debriefing by discussing the themes among the research team.²¹

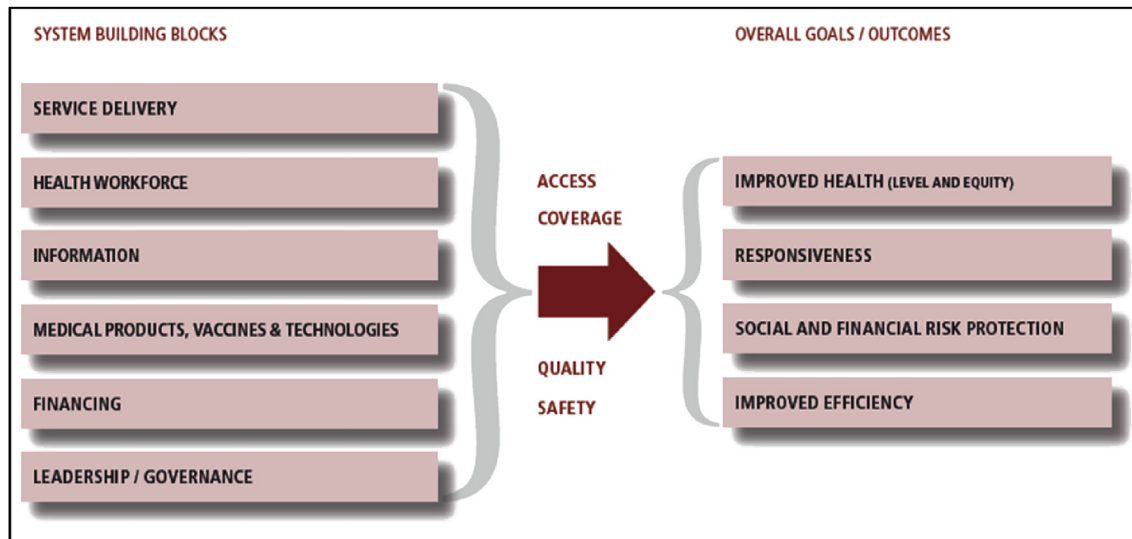


Fig. 1 – The World Health Organization health systems framework.¹⁸

Results

Descriptive information about the organizations, such as geographic setting, types of services provided and year of initiation is presented in Table 1.

Key themes emerging from this analysis were divided into two broad categories – one focused on each of the health system building blocks, and the other focused on cross-cutting issues that were not directly applicable to any of the building blocks (see online supplementary data).

Health system building blocks

Service delivery: The most common causes for utilizing the EMS services were considerably different when comparing the three cities and the two regional levels. Inter-hospital transfers made up the majority of cases in Karachi (53.7%). In Bengaluru, the highest numbers of cases were pregnancy-related (23.4%). Medical emergencies were the most commonly seen category of cases in Punjab Province (47.7%). Pregnancy-related cases were most commonly seen in Karnataka State (40.6%).

Public hospitals were the primary receiving organizations for patients in all three cases. For all three organizations, establishing coordination with receiving hospitals was often

challenging, with few predetermined protocols or arrangements. At the time of data collection, each organization was testing new approaches to improve coordination.

Health Workforce: Aman Foundation and GVK-EMRI both recruit EMTs from nursing cadres, while Rescue 1122 utilize individuals with paramedical degrees. The recruitment approach typically reflected the level of medical response, with more advanced care requiring a workforce with clinical training. Preservice training in all three cases was conducted internally, with curricula developed in-house, with the support of external partners in some instances (Stanford University in the case of GVK EMRI).

The use of doctors in the emergency response was inconsistent across the three cases. At Aman Foundation, doctors were phased out of ambulance crews after a high attrition rate was observed. At GVK EMRI, doctors are employed as Emergency Response Care Physicians, and provide offsite medical guidance to ambulance personnel, and work on their Patient Care Record system (described below). At Rescue 1122, doctors are typically a part of the Officer cadre, and handle administrative, training or supervisory functions.

Medical Products and Technologies: Given poor road quality and difficult weather conditions in each setting, efficiency in maintaining ambulance vehicles is of primary concern. GVK EMRI found that strict adherence to a system of prescheduled maintenance for the vehicles was an effective method of

Table 1 – Background of emergency medical services providers.

	Aman Foundation	Rescue 1122	GVK EMRI
Geographic scope	Karachi City, Pakistan	Punjab Province, Pakistan	Karnataka State, India
Population	~18 million	94.4 million	61.1 million
Sector	Private	Public	Public-Private Partnership
Year initiated	2009	2004	2008
Types of services provided directly by the organization	Emergency medical services	Emergency medical services, fire, rescue	Integrated Emergency Response Services (Medical, Police and Fire)
Level of prehospital care provided	BLS, ALS	BLS	BLS, ALS

minimizing breakdowns and sub-optimal numbers of available vehicles in the fleet. GVK EMRI has also faced some challenges with sourcing parts in more rural locations. In the case of Rescue 1122, easier access to spare parts also improved efficiency. Aman Foundation faced difficulty in sourcing parts due to the vehicle make, which led to fewer deployable vehicles, and ultimately resulted in the organization taking on fewer cases, and ambulance personnel finding themselves without work during those 'repair' periods.

The systems of distributing supplies to ambulances differed considerably across organizations. Both Aman Foundation and GVK EMRI utilized version of the 'push' system of distribution, where supplies were delivered either directly or by other delivery mechanisms to ambulances. Rescue 1122 utilized a 'pull' system of distribution, where personnel picked up supplies from a centralized location. Stock-outs were reported to be least common with Aman Foundation.

Health information systems: GVK EMRI operates a robust computer-aided dispatch system, with calls routed through a sophisticated information technology platform. A separate team of dispatchers works on gathering information from the EMTs in order to 'close' cases. GVK EMRI also operates a Patient Care Record system in order to track 'lives saved', and collect data on 25 types of cases. In the cases of Rescue 1122 and Aman Foundation, data is collected on paper, with challenges in routine data entry into databases.

Leadership and Governance: Stakeholders reported a lack of regulation and standardization of EMS organizations at the national and regional level in each of the three settings. For example, each of the three organizations independently designed and implemented their EMT training programs according to their needs, and those programs did not have to be accredited by a national body, nor were trainees required to obtain certification from external organizations. Both Rescue 1122 and Aman Foundation have pursued accreditation through international organizations, such as the International Organization for Standardization (ISO) and the Joint Commission International.

Bottom-up accountability, or social accountability, was less entrenched than top-down accountability in each of the organizations. However, all three organizations did operate mechanisms for customer feedback.

Health financing: Both Rescue 1122 and GVK EMRI are free to service users. Aman Foundation charges a nominal fee, 300 PKR (2.95 USD in 2013), in order to ensure that users place a value on the services provided, but provides waivers on request. Aman Foundation had previously attempted to cross-subsidize the service through a sliding scale fee structure. However, this fee structure reportedly caused confusion that might have led to lower utilization of services, and was abandoned.

Cross-cutting issues

Gender: These cases highlighted the highly skewed gender ratios in the health workforce for prehospital care. In all three organizations, women were typically hired largely as dispatchers, and rarely as ambulance personnel. Neither of the organizations in Pakistan hired women as EMTs, and in

Karnataka, only 12% were female. The reasons for not hiring women EMTs largely focused on safety; in Pakistan, organizations were concerned about women personnel facing violence, and in Karnataka, women EMTs did not work night shifts for the same reason.

Financial Sustainability: In the case of GVK EMRI and Rescue 1122, the state and provincial governments respectively played a critical role in financing. In the case of Rescue 1122, 'The Punjab Emergency Services Act' of 2006 mandates the establishment and funding of prehospital emergency services in Punjab Province, and sets the rules and regulations by which the service must run. In the case of GVK-EMRI in Karnataka, the state government, through the National Health Mission (an Indian central government initiative), funds the service. In contrast to Rescue 1122 however, there is no legislation in Karnataka mandating the establishment of a service, and therefore, contracts or Memorandums of Understanding between GVK EMRI and the state government must be renegotiated every ten years.

The lack of public sector involvement in EMS in Sindh Province in Pakistan clearly presents a financial challenge for Aman Foundation, as the service is entirely funded through private sources. However, given the high costs of running a prehospital EMS organization and the desire to scale these services, efforts are underway to move the service towards improved financial sustainability. The organization is experimenting with strategies, such as contracting their services to other entities, or engaging in a subscription model with organizations or households.

Coordination with police, fire and rescue: Coordination with police, fire and rescue departments varied considerably across the organizations. As public sector entities or partners both Rescue 1122 and GVK EMRI could formally engage the police, fire or rescue departments. Rescue 1122 includes both fire and rescue as part of the organization's services (including joint training across these personnel), and therefore, coordination was reported to be sound. In the case of GVK EMRI, a police dispatch unit (police officers) is located within the dispatch center, reportedly allowing for more effective coordination with police and fire. Aman Foundation, as a private organization, did not report a formal relationship with police or fire departments.

Community engagement: All three services were actively involved in organizing injury prevention activities with community-level groups, such as training and awareness programs. Rescue 1122 involved community members in disaster preparedness activities. Community members and/or users of the service were reportedly not directly involved in strategy and planning activities in any of the cases.

Discussion

By analysing information categorized under the six 'health systems building blocks' across the three cases, we have drawn out several themes that have implications for programs and research. It should be noted that in addition to different organizational goals, the model of each organization is influenced by distinct social, political, economic and health factors, at the local, regional, national and international

levels, and therefore, explanations behind the similarities and differences observed between the organizations must be carefully considered within that context.

Within leadership and governance, the lack of integration and standardization (in terms of human resources and protocols) of public and private services in all three settings echoes findings from the Pan Asian Resuscitation Outcomes Study (PAROS) and the study by Nielsen et al. across 13 LMICs.^{4,23} Conversely, EMS within high-income countries tends to be more uniform, and largely, funded by the public sector.^{23,24} Weak overarching regulation and lack of standardization of services in this study presented unique challenges. On the one hand, the lack of standardization has led to a diverse range of strategies and approaches, as organizations are free to innovate and pursue their own objectives. An implication of such diversity is that the best practices can surface from the wide variety of models in the market. On the other hand, the lack of regulation standardization meant that the market for EMS as a whole remains fragmented, with little to no regulation over the quantity or quality of services. Without adequate regulatory systems at the national or sub-national levels, the responsibility for emergency care systems is diffused across several public and private actors, without a binding force connecting these actors and ultimately guiding the system.

Public sector support for services appears to be central to the long-term financial sustainability of EMS organizations. Unfortunately, legislation and public policy around EMS is often absent or poorly enforced in LMICs,⁴ as in Punjab Province in Pakistan, the state of Gujarat in India, and the countries of Colombia, Romania and Brazil, appear to have ‘cemented’ structures and resources for EMS through legislation.^{4,25,26} However, public sector support cannot be guaranteed, as seen in the case of Karachi, and there is therefore a distinct need for the private sector to fill these service delivery gaps, particularly for disadvantaged populations. A key question will be how organizations balance the financial sustainability of these services in the short-term, while continuing to advocate for public sector involvement in the long-term.

Within health financing, consistent public sector financing appeared to enable both GVK EMRI and Rescue 1122 to offer their services for free. The cross-subsidy model initially offered by Aman has been used by other private sector EMS organizations in LMICs, such as Ziqitza Healthcare Limited in India, and by other private, pro-poor health service delivery organizations, such as the Aravind Eye Care System, also in India.^{27,28} Prehospital care is a costly service, and therefore, meeting its pro-poor objectives requires steady flows of revenue. In the case of underfunded or inconsistently funded EMS, further research can help unpack the impact of various revenue generation approaches.

From the service delivery component, the divergence in reasons for EMS utilization is intriguing, given the emphasis of all three organizations on poor households, and also similar burden of disease profiles for India and Pakistan, as highlighted in the Global Burden of Disease 2010 Study.^{29,30} Possible explanations could be geographic positioning of ambulances in their settings, or awareness about the services among sub-populations. Finally, understanding the objectives of the organizations’ funders could be insightful.

For example, the high percentage of pregnancy-related cases received by GVK EMRI could be explained by the maternal and child health orientation of the National Health Mission.

In the area of health information systems, the finding that technology could play a pivotal role in streamlining service provision and data collection echoes similar findings from the PAROS study on the utility of investing in technology, as compared to paper-based systems.²³ From computer-aided dispatch, to electronic collection of patient information in the ambulance, to GPS coordinates of the event site, investing in technological solutions could enhance the efforts of organizations considerably.

A reliable and functional fleet of transport vehicles is critical in ensuring the efficient delivery of EMS in LMICs, particularly given road and weather conditions, and the higher likelihood of being involved in road traffic collision. Enforcing a strict system of prescheduled maintenance is one method of offsetting these challenges. Procuring vehicles for which spare parts can be sourced efficiently, or negotiating a deal with the vehicle manufacturers for spare parts, could ease some of these challenges.

The coordination between prehospital systems and receiving hospitals is critical; poor coordination systems may cause lengthened transport times, disorganized care at the receiving hospital, and potentially, negative health outcomes.³¹ Across South Asia, anecdotal evidence exists regarding patients seeking emergency care being turned away at hospitals.^{32,33} The current piloting of strategies for improving coordination could help ameliorate these challenges. Another key coordination challenge is the engagement of EMS with the police, and fire and rescue departments.³⁴ GVK EMRI and Rescue 1122 both have relatively strong collaborations with these services due to their public sector base, but a question emerges as to how private organizations can similarly engage.

In the area of health workforce, pre-entry qualifications and training in each of the organizations was diverse, indicating varied skill sets of personnel. This is expected, given that the organizations have different backgrounds and objectives, but suggests an increasing fragmentation of the health workforce for EMS. A short-term objective could be to encourage sharing of training experiences across organizations, so that more groups are aware of successes and failures from various approaches. In the long-term, the feasibility of standardization across organizations or cadres should be deliberated, a major challenge given the fundamentally different qualifications and training across organizations. The impact of recent efforts in India to create national occupational standards for EMTs through the Healthcare Sector Skills Council should be further examined.³⁵

The paucity of female providers across all three organizations was striking, and raises questions about the acceptability of exclusively male ambulance crews by women users. This might be particularly important in the case of GVK EMRI, which handles a considerable proportion of pregnancy-related cases, but has a low percentage of female staff; though studies have found that users have been satisfied with the quality of care.³⁶ Qualitative studies can further determine whether gender of the ambulance crews factor into

Table 2 – Applicable lessons for EMS stakeholders in low- and middle-income countries.

Early advocacy for legislation: Legislation instituting public services, or public support of services through public-private partnerships, enables longer-term financial and institutional support for EMS organizations. However, as such policy negotiations can be protracted, stakeholders are encouraged to consider their approach early.

Appropriate pre-entry qualifications: Pre-entry qualifications for providing BLS should be geared to those individuals with paramedical training. Doctors can serve an important role in guiding care offsite, rather than being regular members of the ambulance crews.

Female ambulance personnel: The role of females in ambulance crews should be strongly considered and integrated into recruitment approaches.

Computer-aided dispatch: Computer-aided dispatch should be considered early in the design phase, given its role in optimizing dispatch, and in streamlining information systems.

Low-cost and structured ambulance maintenance: Prior to purchase, organizations should ensure that ambulances can be repaired at a low-cost and that spare parts can be sourced without difficulty. Organizations should also consider a mandatory, prescheduled maintenance system for ambulances.

Push system of distribution: A push system of distribution of drugs and equipment, though resource intensive, should be considered in order to ensure that ambulance crews do not face stock-outs.

Primary and secondary prevention: Organizations should consider developing training programs and campaigns (if availability of such programs is limited in their settings), and could explore secondary prevention trainings with corporate entities as a form of revenue generation.

Community participation: Community participation in the service, through user committees or other mechanisms, should be instituted in order to improve utilization and ensure social accountability.

community members' perceptions of the service, or their decision to not use the service.

The organizations are active in injury prevention activities, but direct involvement of communities in planning could be an area of potential action. Community mobilization could improve awareness of emergency care and utilization, and has been shown to improve health outcomes through cost-effective mechanisms.³⁷ The experience of a collaborative EMS organization in Islamabad, Pakistan, Rescue-15, highlights the importance of community participation in enhancing accountability and sustainability.³⁸

Finally, it is important to note that there are linkages between the building blocks, for example between health workforce and service delivery. In the context of EMS, this means that the types and training of personnel will impact the quality of care, or that the types of data generated can influence strategy and planning. Future research can elaborate on the linkages between these blocks, given their importance in understanding the overall functioning of EMS organizations.

Limitations

This analysis had several limitations. First, the studies were carried out as individual case studies, and not with the primary objective of conducting a multiple-case study. Second, we collected our data from managers within the organizations, and did not explore the viewpoints frontline workers or service users into this study. Third and finally, our study was limited to three case studies in South Asian countries, which impacts the generalizability of these findings.

Based on this analysis, we have collated a list of preliminary lessons learnt that could be potentially applicable to EMS stakeholders in LMICs (Table 2). Numerous lessons can be applied from high-income countries to LMICs, but due to shared contexts, we believe there is also considerable transferability of lessons between LMICs. We encourage existing and burgeoning EMS systems to review these lessons and

consider their potential application to their specific contexts. We welcome further study of these issues and call for greater research on the development and implementation of different models of EMS in the developing world.

Author statements

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Ethical approval

This study was deemed not human subjects research, and therefore considered exempt by the Institutional Review Board of the Johns Hopkins School of Public Health (No. 00005124).

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Competing interests

Dr. Junaid Razzak was the Chief Executive Officer of Aman Health until 2014. Dr. Rizwan Naseer was the Director General of the Punjab Emergency Services (Rescue 1122) until 2014.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.puhe.2016.02.022>.