

Health diplomacy through health entrepreneurship: using hackathons to address Palestinian-Israeli health concerns

Khalil B Ramadi,^{1,2} Shriya Srinivasan,^{1,2} Rifat Atun^{1,3}

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¹Hacking Medicine, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA

²Division of Health Sciences and Technology, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA

³Department of Global Health and Population, Harvard TH Chan School of Public Health, Harvard University, Boston, Massachusetts, USA

Correspondence to

Dr Rifat Atun;
ratun@hsph.harvard.edu

ABSTRACT

The universally shared values of improving health and well-being of populations make health a suitable diplomacy tool that transcends populations. The role of entrepreneurship in improving health and contributing to sustainable development is increasingly used in conjunction with traditional health diplomacy. In this paper, we present healthcare entrepreneurship as an effective health diplomacy tool that can spur economic growth, improve healthcare and generate sustainable development in communities. Improvements in health require involvement of diverse stakeholders including healthcare and non-health professionals to generate and implement sustainable problem-focused solutions. We illustrate the utility of early-stage innovation events, such as hackathons, in sparking entrepreneurship, interdisciplinary collaboration, ideation and innovation around problems specific to a local community. Specifically, we describe a hackathon organised in Nazareth, Israel as a means to bridge multicultural communities to address common health issues across the population. We suggest that health entrepreneurship is an important component of health diplomacy, and a critical ingredient for improved health, economic growth and sustainable development.

INTRODUCTION

Health diplomacy is an important feature of foreign policy, and contributes to improvements in global health, human rights, cooperation, security and economic development.^{1–3} More recently, ‘innovation diplomacy’ has been used as foreign policy and development tool. As societies transition towards value-based systems, knowledge has become a primary determinant of economic prosperity, and governments and institutions around the world are realising the importance of grassroots entrepreneurship in achieving sustainable development.⁴ In contrast to top-down approach of government-inspired and government-led initiatives, entrepreneurship relies on strong leadership from the ground level. Empowering individuals

Summary box

- ▶ Health entrepreneurship can be an important component of health diplomacy, can help spur economic growth, improve healthcare, and generate sustainable development.
- ▶ Health entrepreneurship can leverage shared values and goals to transcend sociopolitical and cultural barriers between communities.
- ▶ Early-stage innovation events, such as hackathons, draw a broad range of stakeholders to source problems experienced first-hand by patients and apply multi-disciplinary approaches to develop solutions.
- ▶ A successful innovation ecosystem requires a critical mass of individuals to generate ideas (innovators, advisors, investors), programmes (hackathons, incubators, accelerators) to develop and nurture ideas and a supportive context to sustain them. Programs that democratise and reduce barriers to entry for health entrepreneurship innovation must be encouraged and supported by governments, academic institutions, investors and research funders

across the socioeconomic spectrum through entrepreneurship helps to democratise decision-making for societies, generate economic growth and build bridges across communities and countries.^{5 6} In this paper, we present health entrepreneurship as a unique intersection of innovation and health diplomacy, and an important avenue to improved health, economic growth and sustainable development.

Israel has succeeded in building a substantial entrepreneurial infrastructure over the past few decades, boasting the highest number of startups and venture capital funding per capita worldwide.⁷ However, there is a considerable gap between the subpopulations that participate in this ecosystem. Approximately 20% of the total population of Israel are of Palestinian origin, or Arab Israelis.⁸ This population holds Israeli citizenship and their

status is distinct from the Palestinians living in East Jerusalem, the West Bank and the Gaza Strip (also referred to as the Occupied Palestinian Territories).⁹⁻¹²

As citizens, Arab Israelis have benefited less from many initiatives in Israeli society.¹³ Public services in Arab-Israeli towns are relatively underdeveloped compared with their Jewish counterparts, with lower government spending on schooling¹⁴ and infrastructure.¹⁵ There is relatively higher high school dropout rate among Arabs (14%) compared with the Jewish population (8%), and under representation in higher education: 47% of the Jewish population attend universities versus 30% of the Arab Israelis.¹⁶ The poverty rate among Arab Israelis is more than double (56.9%) that of the Israeli average (20%). Indeed, 9 of the 10 municipalities in the lowest three socioeconomic groups are Arab-Israeli.¹⁷ Infant mortality among Arab Israelis is more than double the rate among that observed in the Jewish population in Israel.¹⁸

The socioeconomic and educational stature of the Arab population has stunted its participation in Israel's bloom of entrepreneurial efforts. To address these challenges, since 2007, the Israeli government has attempted to prioritise the inclusion of the Arab population in Israel's high-tech sector through policy changes. This included the creation of startup accelerators that provided the Arab-Israeli community with business and entrepreneurship expertise.¹⁹ Despite these efforts, however, Arab Israelis still comprise less than 2.7% of the startup activity in the country.²⁰

A growing realisation of this untapped potential of the Arab-Israeli population has recently led to entrepreneurial initiatives seeking to empower young Arab-Israeli entrepreneurs. Venture capital firms and incubators have sprouted in Nazareth and surrounding Arab villages.²¹ Other initiatives have also emerged, including Founders and Coders, an international organisation which leads participants through coding bootcamps and internships; the Middle East Entrepreneurs of Tomorrow programme runs with the Massachusetts Institute of Technology (MIT) that teaches computer science, entrepreneurship and leadership to Israeli and Palestinian high-school students; she.codes, a national programme to teach coding to women, and the Hybrid accelerator launched by the Nazareth Business Incubator Center with a focus on Arab-Israeli entrepreneurs.²²⁻²⁴

Entrepreneurship efforts from a community are important for a number of reasons: (1) entrepreneurship can empower constituents in high unemployment areas and can be a route of financial independence and stability and (2) engaging in entrepreneurial activities instils a sense of ownership, leadership and confidence within the individuals. Studies have shown that entrepreneurs 'imagine themselves as agents of social progress' and seek 'legitimacy from the global prestige of technology industry work practices'.²⁵ On a large scale, this creates a more independent and sustainable society.

Current entrepreneurship efforts among the Arab-Israeli population in Israel are largely focused

on information technology (IT) and software industries. Health entrepreneurship is sparse. Unlike IT and software, however, a strong science, technology, engineering and medicine education is not a prerequisite for health entrepreneurship. In addition, health is a shared language beyond the differences that exist among communities and populations. It is this unique characteristic that establishes the strong value of the use of health entrepreneurship as a tool of health diplomacy.

COMPONENTS OF AN ENTREPRENEURSHIP ECOSYSTEM

Entrepreneurship is a process by which people exploit opportunities for innovation.²⁶ A growing trend around the world is a push to innovation-oriented or 'high-value' entrepreneurship.^{27 28} Fundamentally, this goes beyond the classical entrepreneurship factors of self-employment and emphasises value creation instead.²⁹ Such entrepreneurship seeks to breed prosperity within the system by creation of wealth.²⁵

Entrepreneurship takes place in a community of independent actors.²⁹ An ecosystem relies on recurring, ongoing collaboration between different elements.²⁹ Most fundamental of all are the people. Entrepreneurs with long-term commitments to the ecosystem are vital, as they are able to recognise opportunities and restrictions of the ecosystem, manage them and work with the system together with the available support infrastructure. Invested entrepreneurs are central players in the creation and maintenance of a healthy entrepreneurial ecosystem. Especially in underprivileged areas where government support is lacking, entrepreneurs as leaders of the very ecosystem they thrive on are needed.

Traditional entrepreneurial vehicles of change include incubators, accelerators and venture capital firms for early-stage and later-stage ventures. This is as true in Israel as in most other countries, with enormous financial and human resources poured into incubators and accelerators. Over the last 8 years, over 100 accelerators and 500 incubators have been created in Israel.²¹ However, this approach leads to an omission in the ecosystem, namely, a forum for would-be entrepreneurs to identify problems, build a team and construct the idea of a solution. This is specifically important in health, where the involvement of local health centres and professionals is vital to generate and implement sustainable problem-focused solutions. Far before the need for incubators and accelerators comes the need for idea generation, team formation and the empowerment of individuals with the tools and motivation to create their own ventures.

Hackathons provide an ideal opportunity for such early stage ideation and innovation.³⁰⁻³² Hackathons offer a mechanism to non-specialised populations to learn skills, collaborate with others, connect to resources and experts, and brainstorm to generate solutions to problems. This interaction then positions some participants to start companies and enter early-stage venture development programme, such as incubators. Hackathons are particularly effective in ecosystems where there is a paucity of

Box 1 MIT Hacking Medicine Hackathon Approach

MIT Hacking Medicine hackathon methodology

The Massachusetts Institute of Technology Hacking Medicine (MIT HM) team is a student, academic and community-led group that developed and pioneered the hackathon methodology in 2012 specifically for health, using systems-oriented design thinking to address challenges in health and medicine.³⁰ The MIT HM methodology has employed this process towards over 100 events in over 20 countries in both low-resource and high-resource settings, and continuously refined this methodology over the past 6 years. Over the past 6 years, over 40 companies have been created out of HM events, collectively raising over \$150M in funding.

An MIT HM hackathon comprises four stages: (1) problem identification, (2) team formation, (3) solution conception and (4) iteration and implementation. Individual participants are first invited to pitch a problem they have identified or experienced in healthcare. Participants then mingle to form teams organically based on shared interest. Organisers encourage interdisciplinary teams, to ensure diversity in thought, skill sets and experience. Teams are then challenged with characterising the problem at hand and employing root cause analyses to distill it into distinct sub problems. The team then selects the most relevant, addressable problem and builds a solution to address it. Solutions range from mobile applications to hardware or policy proposals. Mentors present at the hackathon provide continuous feedback to the teams, leading to an iterative innovation process. Mentors are selectively recruited to ensure broad representation of relevant parties: engineers, clinicians, patient advocacy groups, hospitals, insurances, entrepreneurs and investors. Stakeholder analysis is an essential component of generating a solution, ensuring all relevant parties would be incentivised to implement the solution. Specific attention is given to the implementation pathway of the solution—identifying key partners and, if possible, confirming potential interest in the idea. Finally, teams present their final solutions to a panel of judges to win prizes in the form of money or resources dedicated to furthering the venture. Post hackathon, a standardised follow-up is conducted with the hackathon organisers using a codified survey that has been iteratively developed over 6 years and/or semistructured interviews led by MIT HM team members using a topic guide and, where possible, participants. This survey and interview follow-up is used to track the progress of teams formed at the event, monitor their progress overtime and to assess the impact the event had on the local ecosystems, in terms of generating new partnerships, initiatives and connexions across disciplines. The findings are collated in a large database and used to compare with the results achieved across many hackathons regularly held in different jurisdictions.

As with any new methodology or process aimed at generating innovation and solutions, hackathons have their merits and challenges as shown below. MIT HM team is systematically analysing the learning emerging from their experience to date, in order to iteratively build on the merits, but also address the challenges, with greater emphasis on contextual specificities.

innovation methodology, intermingling between expertise and background, or lack of resources for quick experimentation and validation (box 1).

Definition of a hackathon

A hackathon is an event where participants assemble and work together intensely on a specific problem for a

predefined period of time (usually hours to days) without distraction. Hackathons have become commonplace at universities around the world, originally in the context of coding competitions, although more recently as means to jumpstart creativity and entrepreneurship in a variety of fields including policy, healthcare and law.³⁰

Benefits of a hackathon

Hackathons and early stage ideation events can provide a great impetus in shaping a nascent entrepreneurship ecosystem. Hackathons (1) empower people to pursue problems they are passionate about, (2) educate participants in the essential tools of early-stage entrepreneurship, and (3) form the nexus of idea flow from which other entrepreneurial programme such as incubators and accelerators further nurture ideas and teams. In healthcare specifically, a hackathon can bring to light problems that exist and crowdsource solutions from people of different disciplines. This aspect is especially beneficial to areas in which healthcare is underdeveloped. Such events help create a cohesive community by ensuring entrepreneurial interest comes from large institutions and investors as well as grassroots community efforts. This two fold approach is vital to develop a sustainable infrastructure 'tree' to support ventures.

Hackathon merits and challenges

Merits

- ▶ Assembly of diverse stakeholders.
- ▶ Systematic design thinking process.
- ▶ Interdisciplinary teams.
- ▶ Immediate mentorship and guidance.
- ▶ Free and open to all to participate.
- ▶ Independent of intellectual property.
- ▶ Focused time to work on specific issue.

Challenges

- ▶ Implicit bias of participants.
- ▶ Focus on prize rather than impact: participants might be motivated by prize money based on the final presentation, rather than long-term solutions.
- ▶ Continuity of teams post-event.
- ▶ Judging uniformity or bias.
- ▶ Dissemination of results and implementation of ideas.
- ▶ Time constraints: limited time to work on idea.
- ▶ Lack of thorough assumption validation: mentors can help answer questions; however, at hackathons, there is no mechanism to validate assumptions beyond the evidence presented by participants.

Hackathon effort in Arab-Israeli population

In 2017, MIT HM partnered with a local non-profit, Hasoub, to run a hackathon in Nazareth, Israel. Hasoub is a grassroots non-governmental organisation (NGO) seeking to accelerate economic and social change through technology, innovation and entrepreneurship, with a mission to elevate potential Arab entrepreneurs.

Hasoub has engaged over 25 000 people through activities and dozens of online communities. Hasoub has run

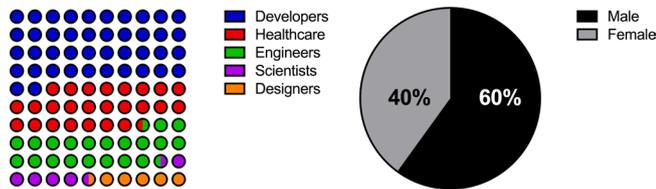


Figure 1 Breakdown of hackathon applicants by professional background and gender.

over 100 events including workshops, public meetups, technology festivals and hackathons, teaching hands-on technical skills to Arab high school and university students. The 165 hackathon applicants spanned most cities in Israel and the West Bank with a variety of disciplines: 40% developers, 24% healthcare professionals (pharmacists, physicians and nurses), 20% engineers, 6% scientists and 5% designers (figure 1). Of these, 72 participants were accepted and attended the event. The average age of participants was 21, and participants were 40%/60% female/male, and 10%/90% Jewish/Arab.

Seventeen teams emerged from the Hasoub HM Hackathon, tackling a wide array of issues. Importantly, the areas of health on which participants decided to work coincided with the leading morbidities experienced by Israeli Arabs and Palestinians living in East Jerusalem, the West Bank and the Gaza Strip (Box 2).

To address the disease burden, one team at the hackathon developed an application to help young adults make healthy diet choices, incentivising them with discount coupons for local stores. Another team developed a tool that would prevent intoxicated individuals from driving. Three teams worked on software solutions

Box 2 Disease burden among Arab Israelis, Palestinians living in East Jerusalem, the West Bank, and the Gaza Strip

After cancer, cardiovascular disease is the leading cause of death in Israel for Arabs and Jewish population alike, and a worrisome trend among Arabs is the increasing prevalence of diabetes and obesity.^{43 44}

Adult-onset diabetes is significantly more prevalent in Arabs rather than the Jewish population.^{43 44} Among young Arabs (grades 7–12) today, an estimated 15% of boys and 9.2% of girls are obese (defined as body mass index above 97th percentiles). In the past 12 years, prevalence of obesity among Arabs in Israel has increased by 50%.¹⁸

Similar trends of increasing cardiovascular disease and associated morbidities such as obesity and diabetes have been reported among Palestinians living in East Jerusalem, the West Bank and the Gaza Strip.⁴⁵ Behavioural risks associated with cardiovascular disease, such as smoking, are also historically higher among Arabs.⁴⁶ Other risky behaviour such as alcoholism has been shown to be on the rise among Arab youth, both in Israel and among those living in East Jerusalem, the West Bank and the Gaza Strip.⁴⁷

Arab Israelis are 2.5 times more likely to develop depression compared with Jewish population,⁴⁸ and Arabs living in East Jerusalem, the West Bank and the Gaza Strip have the highest prevalence of depression among the entire eastern Mediterranean region,⁴⁹ although without adequate services to diagnose and treat mental health conditions.⁵⁰

to mental health and depression. Several other areas were also tackled, including asthma, stroke, postpartum depression, medication adherence, Alzheimer’s disease and emergency care coordination.

Over the course of 48 hours, 17 teams developed 7 mobile applications and 5 physical, functional device prototypes. A group of six high school girls formed a team where they proposed a platform to personalise music choice for patients with Alzheimer’s disease, which has been shown to be associated with improved outcomes in dementia.³³ It is notable that participants developed technologies that fit into problems faced by their peers and families, with the intention of piloting and implementing these tools to improve health in their own community.

HACKATHONS CAN HELP INCREASE ENTREPRENEURIAL EFFORTS AND EDUCATION IN THE ARAB-ISRAELI POPULATION

The attributes of successful ecosystems have been the subject of numerous studies.^{34 35} Hackathons such as the one in Nazareth can help spur the growth and development of an entrepreneurial ecosystem by enhancing specific ecosystem attributes. The MIT HM hackathon targeted the important issues facing the Arab-Israeli entrepreneurs, namely:

1) Design-thinking methodology

To compensate for the lack of exposure to entrepreneurship activities, the hackathon included a design-thinking workshop, which introduced inexperienced participants to innovation methodologies. As part of the hackathon process, this presented a framework for participants to think through complex healthcare challenges.

2) Language

The majority of business transactions in Israel occur in either Hebrew or English—the predominant languages. Most domestic and international competitions require applications in the English language. However, for the majority of Arabs, English is a third language, naturally decreasing their fluency. This entire event was conducted in English, to serve as a common neutral language across Jewish and Arab populations as well as international organisers and sponsors. This also served to encourage the Arab population to develop more familiarity and comfort with English.

3) Partners and sponsors

Entrepreneurial efforts characterise participants as would-be entrepreneurs: collaborative, technical and constructive.^{36 37} This characterisation incentivises a myriad of sponsors and partners to invest in such initiatives. International development foundations, NGOs, as well as industry partners have traditionally mobilised around the idea of entrepreneurship as a driver of grassroots social change. This hackathon featured partners including US Agency for International Development (USAID), Deloitte, Samsung, Hult Prize and Microsoft. In order to facilitate progress after the hackathons,

partners were invited to host booths and give short talks. Speakers from the University of Haifa and the Technion were also invited to give talks, mentor and network with participants. Participants were able to form relationships expanding their network and having a starting point to progress their hackathons projects, whether to seek business partnerships, technological advice or funding.

By decreasing the barrier of access for the Arab-Israeli population, the hackathon facilitated a network to increase the ability of Arabs to engage with the entrepreneurial ecosystem. Incorporating an application or mentorship sessions in Arabic throughout the event might further improve accessibility of future events to Arab Israelis. A vital component, leaders in innovation and participants from the Jewish community also attended the event. Cross-pollination between the two cultural communities led to the formation of teams bridging the sociopolitical gap.

Throughout the event, semistructured interviews were conducted with participants to solicit feedback. Education, exposure and hands on practice with networking, presentation, ideation and prototyping reinforced the abilities of participants to become strong cofounders of new healthcare ventures. Participants reported that exposure to so many components in 1 weekend helped them realise the scope of the entrepreneurial process. Moreover, younger students at the event stated that the opportunity motivated them to consider the entrepreneurial path after college. The iterative mentoring methodology employed left participants with a variety of perspectives on how to move their projects forward after the hackathons. Various press organisations, TV and local news outlets helped cover the event and spread awareness about the initiative.

Participants have said that the most valuable take away was the mindset of problem-focused solutions. Indeed, the most successful companies out of MIT HM events were those that identified an unfilled niche to insert themselves.³⁸ Hackathon participants also learn the basic processes of assumption validation, stakeholder analysis and root cause analyses. These are topics often taught in incubator programme. Instead, teams are challenged to learn by doing over the course of just a few days. The interdisciplinary nature of events allows for cross-pollination of ideas across disciplines. The inclusion of non-medical expertise in improving healthcare delivery breaks down the traditional clinical silo that exists and democratises the innovation and entrepreneurship process.³⁹

We assessed the outcome of the hackathon on the overall Arab-Israeli innovation ecosystem 12 months after the event by contacting and reviewing progress with event organisers using key informant interviews (organisers and sponsors). Informants reported that teams experienced challenges in developing and commercialising their ideas, revealing the nascent support system for entrepreneurial ventures, in particular lack of access to seed funding, and hitherto reliance on more traditional, reliable lines of work in the community. However, in spite of these challenges, over

10% of the participants have joined the Hasoub grassroots organisation as volunteers, helping to organise other workshops and events around the country, illustrating the strong interest in entrepreneurship notwithstanding cultural limitations. The follow-up to the hackathon saw Hasoub fundraising over US\$250 000 from local and international investors to support similar future events and early-stage ventures. Realising that a dire need within the community was a bridge to fill the gap between hackathon and incubator-ready startups, Hasoub is investing in university campus presence across the country as well as building an innovation centre in Nazareth, to facilitate teams continuing along the path to commercialisation. Partnerships with Microsoft, Mobileye, Deloitte, USAID and the US Embassy that originated in the hackathon have also continued, drawing in key stakeholders to support ventures past ideation.

THE UTILITY OF HACKATHONS

The partnership with Hasoub laid the foundations for greater efforts in the ideation phase in the community. While several accelerators and incubators exist, even ones like Takwin Labs that specifically target Arab population, very few efforts to nurture ideation exist.⁴⁰ By providing education and hands-on experience over the course of a weekend, the MIT HM-Hasoub hackathon catalysed the startup efforts for a community lacking expertise or role models in the area. Participating organisations such as Ibtakar—a socioeducational initiative that promotes technology an innovation among Arab students—took away key lessons and content to help bolster their own workshops and curricula, which would extend to the Arab-Israeli and Palestinian community. Events like the Hasoub-HM hackathon can help educate the Arab community on the culture and practices of entrepreneurship. The relatively young average age (21 years) of the participants exemplified the yearning for entrepreneurship among the Arab-Israeli youth.

This hackathon was somewhat unique among other similar events as a result of the local sociopolitical context. While it employed methodologies similar to other hackathons, the overarching goal was to serve as a bridge between disparate cultures and communities. The hackathon leveraged health as a shared common interest as the basis for entrepreneurial collaboration. A related objective was education, specifically of those with less formal training in entrepreneurship. Methods of design thinking and innovation could be taught through first-hand experience to groups comprising multicultural backgrounds.

Frequent critiques of hackathons suggest that they are too short of an event to generate lasting enthusiasm and progress, particularly for complex healthcare issues.⁴¹ We find that the utilities of a hackathon are numerous and context dependent. Hackathons are a single component of an ecosystem necessary to generate and sustain innovations. In environments where entrepreneurship is nascent, they serve as a primary driver to raise awareness of innovation pursuits and enable people to experience this path without a radical life shift. As the experience in Nazareth

suggests, they are also reliable methods to source pain points in health from the population and demonstrate to people of all socioeconomic and professional backgrounds that they are able to contribute together to addressing these problems. Coupled with institutional partners and investors, they serve as runways for new ventures creating value for the community.⁴²

CONCLUSION

We identify the benefits of entrepreneurship for the development of socioeconomically disadvantaged populations and illustrate this with an example of the Arab community within Israel.

In pursuit of jumpstarting the entrepreneurship process and empowering the population with the confidence, skills and ambitions to become a larger player in the startup space, Hasoub has been leading workshops and training sessions in Nazareth. To further efforts towards entrepreneurship in the health space, a partnership with MIT HM was created and a hackathon took place in September 2017. Bringing together Arab-Israeli and Jewish stakeholders, key academic and industry figures along with governmental agencies, the event bridged cultural lines and created an open forum to allow participants to network with large organisations, which could help move their ideas forward. Importantly, participants were exposed to health innovation methodologies and received the opportunity to learn, build diverse teams and create solutions to health problems. By lowering barriers of access and resources in the Arab community, the hackathon furthered the entrepreneurial efforts of Arab-Israelis in the ideation phase and positioned them to be competitive within global startup ecosystem.

This case study may be relevant to numerous other global contexts. There is an increasing emphasis on soft power and people-to-people connexions in foreign affairs. By encouraging entrepreneurial efforts, countries can positively reshape relationships among societies and spur economic growth for sustainable development. Health entrepreneurship is an important component of health diplomacy, and a critical ingredient for improved global health, economic growth and sustainable development.

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Correction: *Health diplomacy through health entrepreneurship: using hackathons to address Palestinian-Israeli health concerns*

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The published version misspelled co-author Shriya Srinivasan's name and affiliation incorrectly which is now rectified.

Khalil B Ramadi^{1,2}, Shriya Srinivasan^{1,2}, Rifat Atun³

1. Hacking Medicine, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA
2. Division of Health Sciences and Technology, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA
3. Department of Global Health and Population, Harvard TH Chan School of Public Health, Harvard University, Boston, Massachusetts, USA

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