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The economic impact of COVID-19 pandemic on physicians/health care work force in Egypt

Rehab Abdelhai Ahmed[1], Amany Ahmed Salem[1], Eman Hany Elsebaie[1], Sherif Shamseldein[2], Mustafa Ahmed Hassan[3], Amal Samir Sedrak[1]
[1]Department of Public Health and Community Medicine, Faculty of Medicine, Cairo University, Cairo, Egypt
[2]Ministry of Health and Population, Cairo, Egypt
[3]American University, Cairo, Egypt

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ABSTRACT

The COVID-19 pandemic has impacted healthcare workers physically, psychologically, and economically. The industry has struggled financially with the cancellation of elective procedures and hesitancy from patients to seek medical help. Thus, this study aimed to assess the economic and work burden of COVID-19 on the health workforce in Egypt. Methods a cross-sectional survey was conducted in Egypt from October 2020 to May 2021. A purposive sample of 763 healthcare workers (HCWs) from Egyptian governorates was included. HCWs were asked to fill out a self-administered questionnaire on Google Forms and printed copies. The questionnaire link was shared on social media forums. Results a total of 763 HCWs responded. Females were 88.2% and more than half were 33 or less years old. Physicians constituted 42.5%, while paramedics 57.5%. The governmental sector represented 61.2%, private sector 14.7% and those who combined both 24.1%. Regarding specialties affected, pediatricians, dermatologists, and nephrologists reported a considerable drop in their regular private work rate, while radiologists were not affected regarding workload or income by the closure. The HCWs acknowledge that COVID-19 has put extreme stress on the healthcare workforce physically, mentally, and financially in a pre-existing challenging environment. The results can help evidence-based decisions by policymakers in Egypt.

Corresponding Author:

Eman Hany Elsebaie
Public Health and Community Medicine Department, Faculty of Medicine, Cairo University
Cairo, Egypt
Email: eman.elsebaei@kasralainy.edu.eg

1. INTRODUCTION

In less than three months, (SARS-COV-2) in 2019 has been spreading rapidly across the world, becoming a pandemic, affecting around 200 countries and claiming more than 6.9 million lives by the end of 2023 [1]. Generally, pandemics hit all health attributes of human life, starting from operating vital health services, passing by the accelerated demand for healthcare equipment, and questioning the endurance of the health system. Unfortunately, the results stem from these attributes' status quo are substantially interlinked [2]. The reasoning factors may be manifest and directly impact the health system, such as mechanical ventilator shortages and operating room closures due to COVID-19 contamination. Also, It may affect the health system indirectly by reorganizing dialysis units and infusion centers to comply with social distancing regulations, and indeed the frontline healthcare worker burnout, as well as their mental health [3].

In other words, the health system's strength does not only affect the healthcare services delivery to stakeholders, but it also affects socio-economic factors that may lead to changes in the fabric of the society. Some of these changes that might happen are the change of socio-economic conditions of the healthcare workforce as a direct impact of pandemics due to excessive workload during times of crisis [3], and getting infection for the person that belongs to the health workforce or his/her family members causing to immediate increase of medical expenses, which usually comes from savings, which is rapidly eroded especially amid communities that have high rates of money out-of-pocket spent on healthcare services.

Lessons from different outbreaks proved the fact that health systems expressed many challenges amid the soaring demand for health services, and unfortunately, these challenges became severely interactable for the healthcare workforce. In the same context, previous pandemics provide evidence about different health systems' reactions in Europe towards the eruption of the Spanish flue between 1918 to 1919, which reveals how the rapid spread of the pandemic had pressured health systems to fail in contamination, and some countries, had collapsed. The Spanish flu pandemic (H1N1) brought about a death toll of around 20-50 million people and around 16% loss of the world gross domestic product (GDP) [4]. Importantly, these causalities varied from one country to another depending on the specific causing factors [5]; some of them are the "weak health system", "poor hygienic conditions", and "wealth quantiles". Almost all these critical reasons were combined in Italy during 1918 causing the highest total death toll in the world by 35% [6]. Another recent lesson was that novel influenza broke out in March 2009 in a small city of La Gloria East region of Mexico; the pandemic was caused by the so-called "Triple Reassortant" resulting in around 18,500 causalities worldwide [7]. Like the Spanish flu, some scholars refer to the wide spread of the pandemic among the Mexican regions due to the cities' density causing pressures on public health as they show how much the infection map and the population distribution were identical, which eventually led to soaring demand on health care services.

Despite major differences between (SARS-COV-2) and the Spanish flue regarding the wide spreading and mortality rate, 2.4% for COVID-19 and 2.5% for the Spanish flue [8], there are major differences between the two pandemics, some of them related to this study are the economic impact and the raising vulnerability of health care systems. First, the Spanish flu caused around 9$ billion in losses around the world. Albite this, the real loss is deemed as hard to calibrate due to the lack of data and recorded statistics during this time [8]. On the other hand, the pre-emptive procedures taken by different governments in the world have led to an immediate halt of economic activities, which led the world economy to be depleted by 5.76$ to 6.17$ trillion decreases in the world GDP [8]. Second, technological innovation in vaccine industrial-related sectors prevailed nowadays, which has rapidly led to vaccine availability and much quicker screening processes that help in diagnosis and treatment.

Available works of literature about the impact of major pandemics that the world has witnessed discussed how each pandemic has led to the health system collapse regarding equipment, timeline, and the number of daily treatments, whilst there is a lack of literature discussing the socio-economic circumstances surrounding health workforce amid an intense wave of a deadly pandemic. Accordingly, this paper aims to discuss the ongoing socio-economic circumstances of the health workforce in Egypt from two perspectives. The first perspective is the COVID-19 impact on those special laborers and their capacity to provide health services. The second one is the COVID-19 impact on the health workforce families and their economic conditions as they are the most vulnerable segment of the population and almost the only sector, besides the security apparatus, that reversely works during the status of curfews and lockdown procedures in order to accelerate its services, as well as, pushing more health workforce to the front line.

In the same context, this study tries to discover how much these two aforementioned perspectives are interdependent and irreplaceable using econometric modeling. Also, the study tries to figure out the economic behavior of the health workforce during times of pandemics depending on different working areas: "urban or rural"; and the impact of the state's different mitigation policies on the practice of various medical specialties.

2. METHOD

2.1. Study design

An analytic cross-sectional study aiming to assess the economic and work burden of the COVID-19 pandemic on HWF in Egypt. Study setting: The study took place via an electronic survey. It was conducted throughout a period of seven months, from October 2020 to May 2021. Study Participants: adults of any age affiliated with the healthcare workforce were approached through personal contact with the research team.

- Eligibility criteria: any Egyptian adult (living in Egypt during the COVID-19 pandemic), affiliated with the healthcare workforce (physicians, nurses, lab technicians, and pharmacists), and with access to electronic media, willing to participate in the study and signing the electronic consent.

- Exclusion criteria: any member of the healthcare workforce who refused to participate. OR with no access to electronic media were excluded from the study.

2.2. Sample size and technique

A non-probability purposive sampling technique was performed. Considering the Primary outcome as the percentage of participants reporting income and wealth losses, an Open Epi sample size calculator [9] was used to calculate the sample size of the present study. Assuming 80% power of the study, 0.05 level of significance, and 80% null hypothesis value, the 50% prevalence is the regular assumption for precision sample size calculations when the true prevalence is inaccessible. Conforming to the Sample size equation for cross-sectional studies, 384 participants was the minimum number of participants. Considering the non-response rate of online surveys 40%, the minimum required number was 538 participants and the final sample recruited to the study was 763 participants.

Participants were recruited via a mixture of sampling techniques: snowball sampling technique was used, using personal and professional networks (e.g., email, social media and messenger apps, and mailing lists). To achieve a better representation of healthcare workers for various socioeconomic variables and public and private affiliations, the research team represented different medical specialties. Groups on social media (Facebook, WhatsApp, LinkedIn) were utilized. In addition, Facebook enables users to "promote" posts to demographic viewers for a small fee, supporting the post to appear on their newsfeed.

2.3. Data collection tool

An anonymous structured questionnaire was designed. The study utilized questions in the English language. The authors approved the content and face validity of the questionnaire. The questionnaire was piloted on 25 healthcare workers (HCWs), who were later excluded from the analysis. No changes were made to the questionnaire based on the results of the pilot testing. The study questionnaire's internal consistency was assessed using the Cronbach alpha method, with a value of 0.75. The investigators did not encounter any potential sources of bias during data collection. The questionnaire included the following sections:

- Sociodemographic data: age group, gender, job, affiliation, household size, average annual household income.
- Spending category: spending pattern/month during COVID-19 pandemic, debt payments, housing (rent, maintenance, home insurance), utilities (water, and electricity), food, clothing, footwear, personal care, gasoline, other transport (public transport, car maintenance), medical, travel, recreation, and entertainment, education and childcare, furniture, jewelry, small appliances, and other small durable goods, any other spending (mention).

Opinion concerning lockdown impact on the demand side:

- Explore the decline in the work activities from the respondents' perspective.
- Opinion concerning economic losses during the COVID-19 pandemic, whether caused by personal or family COVID-19 illness (especially catastrophic health expenditure).

N.B. catastrophic health expenditure is defined as out-of-pocket spending surpassing 10% of total consumption or income by the budget-share approach with two benchmarks, as well as out-of-pocket expenses exceeding 40% of nonfood consumption [10]. The online questionnaire was pilot-tested on 35 people and refined accordingly based on feedback. Statistical analysis, the distribution of the socio-demographic variables in the studied sample were stated using simple frequencies. To simplify the analysis, responses for the following seven dependent variables were transformed into 2 categories: as follows.

"Private work affection upon closure", "Income affection upon closure", "Work hours during closure", "what happened after opening", Work hours after opening" "Income affection during closure if partner is healthcare worker" and "Income affection after opening if partner is healthcare worker" They were transformed into "Lower than 50% or not affected" and "higher than 50%". In addition, the dependent variable "How much loss of profit after COVID-19 infection" was transformed into "Less or equal 40%" and "More than 40%" categories.

Bivariate relationships between different categorical variables were assessed using pearson's $\chi 2$ test. p-values below or equal to the two-tailed alpha=0.05 level were considered statistically significant. Practical significance was considered when interpreting differences in the results. The statistical package for social science (SPSS version 21) was used for data analysis. Simple descriptive statistics was used to summarize quantitative data. Bivariate analysis was displayed between different independent variables e.g. age categories, different medical specialties, and the above mentioned dependent variables. Cross-tabulations and a comparison of proportions were performed using the chi-square. P value$\leq$0.05 was considered significant.

2.4. Ethical consideration

Participants were informed about the study's objectives prior to starting the survey and given the option to accept or decline participation. Healthcare workers who chose not to participate or complete the survey were excluded from the study results. Online consent was obtained from those who agreed to participate. The survey questionnaire is anonymous, ensuring strict confidentiality of participants' personal data. This confidentiality is maintained throughout the data collection, entry, and analysis phases of the study in accordance with the Helsinki Declaration (N-102-2020).

3. RESULTS AND DISCUSSION

An online survey was distributed to 790 medical field workers; 763 **(**96.5%) of them agreed to complete it, most of our respondents were females (88.2%), and more than half of the included participants were 33 or fewer years of age (56.2%). Notably, 79.9% of all respondents were residents of urban areas. Almost all the participants were bachelor's degree holders or have a postgraduate degree (48.2% and 51.6% respectively). The majority were physicians (42.5%) while the paramedic workers represented 57.5% Table 1.

Table 1. Demographic characteristics of survey respondents

Characteristics		N (%)
Sex	Female	673 (88.2)
	Male	90 (11.8)
Age categories	Less or = 33	429 (56.2)
	More than 33	334 (43.8)
Residency	Urban	610 (79.9)
	Rural	153 (20.1)
Education	Bachelor	368 (48.2)
	Diploma	7 (0.9)
	Postgraduate	386 (50.6)
	High institute	2 (0.3)
Profession	Physician	324 (42.5)
	Dentist	73 (9.6)
	Pharmacist	299 (39.2)
	Physical therapist	45 (5.9)
	Veterinarian	11 (1.4)
	Nurse	11 (1.4)
Profession (physicians and others)	Physicians	324 (42.5)
	Paramedics	439 (57.5)
Specialty of physicians	Academic	20 (6.2)
	Anesthesia/ICU	14 (4.3)
	Clinical pathology	18 (5.6)
	Dermatologist	28 (8.6)
	ENT	21 (6.5)
	Family medicine	26 (8)
	GIT/Hepatology	7 (2.2)
	Internal medicine	28 (8.6)
	Nephrologist	7 (2.2)
	Obstetrics/Gynecology	29 (9)
	Ophthalmologist	17 (5.2)
	Pediatrics	38 (11.7)
	Psychiatry	11 (3.4)
	Public health	6 (1.9)
	Pulmonologist	9 (2.8)
	Radiologist	18 (5.6)
	Rheumatology	8 (2.5)
	Surgery	19 (5.9)

Most of the respondents were affiliated to the governmental sector (61.2%), with approximately fourth of the respondents (24.1%) have dual practice. Majority of the respondents reported earnings of less than 10 K Egyptian pound (EGP) pound/month with more than 90% of the participants were less than 20 years' experience Table 2. Among participants expressing more than 50% reduction in private work, physicians were the highest category (53.5%). When comparing paramedics with physicians, lower percentage of them (46.5%) mentioned affection of private work by more than 50%. In the current study it was demonstrated that; participants with dual practice represents the highest percentage (62.2%) among HCW with shrinkage in private work (by more than 50%) Table 3.

Among participants expressing lowering Income upon closure by >50%, Those with dual practice were the most affected (64.1%), followed by those affiliated only to private sector. Increasing the income upon closure by more than 50% was reported by a very small number of participants Table 4. The majority of participants didn't purchase durable assets in the last six months or were planning to purchase in the next 12 months of the survey conduction; this observation wasn't different among the different profession categories, affiliations, residency, or income levels as illustrated in both Tables 5 and 6.

Table 7 shows that the most of the participants, 94.3%, experienced personal payment upon acquiring COVID-19 infection, while only around 24% mentioned experiencing catastrophic health expenditure (more than 40%) due to COVID-19 infection. Also, 26.5% only of the interviewed HCWs mentioned changing their work patterns after being treated for COVID-19 [7].

Table 2. Employment and income status of survey respondents

Variable		N (%)
Employer	Governmental	467 (61.2)
	Private	112 (14.7)
	Both	184 (24.1)
Experience years	Less than one year	19 (2.5)
	1-5 years	216 (28.3)
	6-10 years	246 (32.2)
	11-15 years	173 (22.7)
	16-20 years	47 (6.2)
	More than 20 years	62 (8.1)
Income	Less than 10k	654 (85.7)
	10k-<25k	73 (9.6)
	25k-50k	32 (4.2)
	More than 50k	4 (0.5)
Own private clinic/pharmacy/ center/hospital	No	623 (81.7)
	Yes	140 (18.3)
Work at private clinic/pharmacy/center/hospital	No	538 (70.5)
	Yes	225 (29.5)

Table 3. Private work affection upon closure

Variable		Private work affection upon closure		
		Not affected N (%)	Lower by >50% N (%)	Higher by >50% N (%)
Profession	Physician	28 (48.3)	61 (53.5)	1 (100)
	Dentist	6 (10.3)	20 (17.5)	0 (0)
	Pharmacist	20 (34.5)	19 (16.6)	0 (0)
	Physical therapist	1 (1.7)	9 (7)	0 (0)
	Veterinarian	1 (1.7)	3 (2.6)	0 (0)
	Nurse	2 (3.4)	2 (1.7)	0 (0)
Profession (physicians and others)	Physicians	28 (48.3)	61 (53.5)	1(100)
	Paramedics	30 (51.7)	53 (46.5)	0 (0)
Employer	Governmental	7 (12.1)	11 (9.6)	0 (0)
	Private	24 (41.3)	32 (28.2)	1 (100)
	Both	27 (46.6)	71 (62.2)	0 (0)

Table 4. Income affection upon closure

Variable		Income affection upon closure		
		Not affected N (%)	Lower by >50% N (%)	Higher by >50% N (%)
Profession	Physician	31 (50)	59 (57.3)	1 (50)
	Dentist	6 (9.7)	20 (19.4)	0 (0)
	Pharmacist	21 (33.9)	14 (13.5)	0 (0)
	Physical therapist	1 (1.6)	7 (6.7)	1 (50)
	Veterinarian	1 (1.6)	2 (1.9)	0 (0)
	Nurse	2 (3.2)	1 (0.97)	0 (0)
Profession (physicians and others)	Physicians	31 (50)	59 (57.3)	1 (50)
	Paramedics	31 (50)	44 (42.7)	1 (50)
Employer	Governmental	11 (17.7)	10 (9.7)	0 (0)
	Private	27 (43.5)	27 (26.2)	1 (50)
	Both	24 (38.7)	66 (64.1)	1 (50)

Table 5. Purchased home device/car/apartment past six months

Variable		Purchased home device/car/apartment past six months	
		No N (%)	Yes N (%)
Residency	Urban	539 (88.4)	71 (11.6)
	Rural	139 (90.8)	14 (9.2)
Profession	Physician	279 (86.1)	45 (13.9)
	Dentist	63 (86.3)	10 (13.7)
	Pharmacist	271 (90.6)	28 (9.4)
	Physical therapist	43 (95.6)	2 (4.4)
	Veterinarian	11 (100)	0 (0)
	Nurse	11 (100)	0 (0)
Profession (physician and others)	Physicians	279 (86.1)	45 (13.9)
	Paramedics	399 (90.9)	40 (9.1)
Income	Less than 10k	591 (90.4)	63 (9.6)
	10k-<25k	61 (83.6)	12 (16.4)
	25k-50k	24 (75)	8 (25)
	More than 50k	2 (50)	2 (50)

Table 6. Planning to purchase a home device/car or apartment in the next 12 months

Variable		Plan to purchase home device/car/apartment next 12 months	
		No N (%)	Yes N (%)
Residency	Urban	413 (67.7)	197 (32.3)
	Rural	94 (61.4)	59 (38.6)
Profession	Physician	211 (65.1)	113 (34.9)
	Dentist	50 (68.5)	23 (31.5)
	Pharmacist	198 (66.2)	101 (33.8)
	Physical therapist	34 (75.6)	11 (24.4)
	Veterinarian	6 (54.5)	5 (45.5)
	Nurse	8 (72.7)	3 (27.3)
Profession (physician and others)	Physicians	211 (65.1)	113 (34.9)
	Paramedics	296 (67.4)	143 (32.6)
Income	Less than 10k	437 (66.8)	217 (33.2)
	10k-<25k	50 (68.5)	23 (31.5)
	25k-50k	20 (62.5)	12 (37.5)
	More than 50k	0 (0)	4 (100)

Table 7. Impact of COVID-19 infection on physicians

Variable		N (%)
Disease duration in days	Less or=14 days	114 (49.3)
	More than 14 days	117 (50.7)
Payment for medical care	Personal payment	218 (94.3)
	Public insurance	5 (2.2)
	Private insurance	8 (3.4)
Income affection after COVID-19 infection	Less or equal 40% of non-food consumption	176 (76.2)
	More than 40% of non-food consumption	55 (23.8)
Work pattern changes after treated from COVID-19	No	170 (73.5)
	Yes	61 (26.5)

The healthcare services have been significantly affected by the COVID-19 pandemic, which is a major crisis in the healthcare sector. In the face of this unprecedented crisis, healthcare providers have encountered numerous difficulties in treating patients with COVID-19 [11], [12]. Healthcare workers are facing an increased awareness about their psychological burden and overall wellness. Research indicates that healthcare workforce experiences high rates of burnout, psychological stress, and suicide. These negative effects include high rates of infection and death, excessive financial hardships, stress related to both known and unknown information, and fear of uncertainty regarding the continued impact [13], The systematic practice of the government, in addition to private practitioners, is also seriously affected by the pandemic [14].

In Egypt, from January 3, 2020 to October 26, 2022, there have been 515,401 confirmed cases of COVID-19, with 24,798 deaths reported to the World Health Organization (WHO) [15]–[17]. The COVID-19 pandemic has had a profound impact on healthcare professionals (HCPs), particularly doctors, pharmacists, and nurses employed in public isolation facilities. According to the Egyptian medical syndicate, over 600 physicians lost their lives between February 2020 and January 2022 due to the pandemic [18]. This is where our study perspective has become crucial to elucidate. During the period of (October 2020 to May

2021), we conducted a study comprising 763 medical field workers to assess the economic and work burden of the COVID-19 pandemic on HWF in Egypt. Our results underlined that 88.2% of the surveyed (HCW) were females, which is allied with the worldwide trending pattern reported by the WHO in March 2019, that 70% of the global health and social care workforce are females, either in hospitals, clinics, health services, or social assistance [16], [17].

Also, the results of the current study highlighted that dual practice among the participant HCW accounts for 24.1% of the total sample. This was in agreement with a study conducted in Cambodia to assess the dual practice among physicians, which revealed that 25.4% of the surveyed sample were working in both the public and private sectors [19]. This was echoed in a cross-sectional survey conducted among physicians in two states in Brazil to highlight changes experienced in terms of working hours and earnings in the second year of the pandemic, where the majority of the sample (61.6%) were engaged in dual practice [20].

This prevalence of dual practice might be justified by the need to compensate for insufficient salaries, which leads healthcare workers to depend on individual coping strategies. Numerous clinicians combine their public-sector clinical work, which is salaried, with a private clientele that pays them on a fee-for-service basis. This dual practice is often used by HCWs to fulfill their basic needs, indicating that the health ministries are unable to provide them with adequate salaries and working conditions [21].

Our study results have confirmed the deleterious effect COVID-19 had, especially on physicians in Egypt, where more than half (53.5%) of those experienced private sector reduction by more than 50% were physicians. This was in agreement with an online survey conducted in May, according to the Texas Medical association, a majority of practicing physicians have been affected by the COVID-19 pandemic. Approximately, 68% of physicians have had to reduce their private practices, while 62% have experienced a decrease in their salaries [22].

Additionally, a study was conducted to evaluate the impact of the COVID-19 pandemic on private practitioners in India demonstrated that HCPs working in private sector were affected dramatically in the financial and mental aspects, especially during the lockdown [23]. This was attributed partially to the decline in private practice, caused by fear of catching the disease, leading to increased financial burden and hence stress [24].

Also, because of the significant reduction in the private medical practice workload, the overall income was significantly reduced (lowered by more than 50%) by 57.3% of the interviewed physicians. This was in accordance with a cross-sectional survey that included a representative sample of 1,183 physicians from two Brazilian states, São Paulo (SP) and Maranhão (MA), to understand the fluctuations in working hours and and incomes during the second year of the pandemic. The results showed that more than half of the private-only doctors across both states experienced a decrease in their earnings (52.2%, 95% CI 45.6–58.8) [25].

Furthermore, a study was conducted in Quebec to explore the workload and satisfaction of HCPs in out-patient clinics during the pandemic, highlighting that show that, the pandemic has various ramifications on the professional life of HCPs, where many HCPs were professionally burdened by lockdown measures, with one-third of surveyed HCPs losing work during the lockdown period [26]. The overall decrease in income among health professionals can be attributed to two main factors. Firstly, a significant reduction in demand for care has led to a substantial loss of income for many. Some have experienced a decrease in elective work, while others have seen patients forgo services. For instance, American radiologists have faced reduced demand for services due to fewer traffic injuries during the lockdown, and neurologists have reported that services were postponed due to limited hospital capacities, and patients avoiding clinics for elective care out of fear of contracting COVID-19 [27]. This also was in accordance with the World Bank Report demonstrating the economic burden of COVID-19 Infections amongst HCWs, where the results revealed that overall, infection with COVID-19 among HCWs led to crucial socio-econimic costs. According to the report, the economic impact of HCW infections is significant. The estimated cost per infection is $10,000 in Colombia, which is 1.5 times the GDP per capita. The burden is even greater in Kenya, where the cost is almost $34,000 (18 times GDP per capita), and in Eswatini, where it is almost $36,000 (9 times GDP per capita) [28]. Other studies claimed that out of pocket payments (OOP) spending could have augmented because more patients with COVID-19 used the private sector (where OOP costs are advanced) to avoid exposure to COVID-19 in the public sector [29], [30].

For lancet findings of this study concerning catastrophic health expenditure were in harmony with a study published in the Lancet, to study the catastrophic health expenditure during the COVID-19 pandemic in five countries [31]. In three of the five countries examined, health systems did not provide adequate financial protection or maintain healthcare access in 2020, suggesting a failure to uphold basic functions. The COVID-19 response in 2020 expedited the transition to private healthcare in some areas.

4. CONCLUSION

The COVID-19 pandemic has significantly impacted the healthcare workforce, endangering not only their lives but also eroding about half of their income. This has also affected their willingness to purchase durable goods such as cars and real estate. It is noteworthy that a majority of the healthcare workforce are females, which means the successful stories of gender equality within the health sector are diminishing due to the pandemic's abrupt change in income.

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BIOGRAPHIES OF AUTHORS

Rehab Abdelhai Ahmed Professor and Chair of Public Health and Community Medicine department at Faculty of Medicine Cairo University. Professor Abdelhai is an epidemiologist/statistician and an alumnus of the London School of Hygiene and Tropical Medicine where she obtained a MSc degree. She has served as a technical officer at WHO during the period 2014-2017. She can be contacted at email: rehababdelhai@kasralainy.edu.eg.

Amany Ahmed Salem Lecturer of Public Health and community Medicine at Faculty of medicine Cairo University, specialized in health economics, outcome research and statistics, she obtained a professional Master of Health Economics from Cairo University. She can be contacted at email: amany.ahmed@kasralainy.edu.eg.

Eman Hany Elsebaie Associate professor of Public Health and community Medicine at Faculty of medicine Cairo University and Armed forces College of Medicine, specialized in health economics, health care management and statistics, she obtained a professional Master of Health Economics from Cairo University. She can be contacted at email: eman.elsebaei@kasralainy.edu.eg.

Sherif Shamseldein A consultant at the Ministry of Health and Population, Cairo, Egypt, specializing in infectious diseases. He holds a master's degree in clinical investigation from Harvard Medical School with a research interest in infectious diseases. He can be contacted at email: sherif.shamseldein@outlook.com.

Mustafa Ahmed Hassan A commercial diplomat and scholar at the American university in Cairo, AUC. He holds a master's degree in economics of international development and is a specialist in political economy. He can be contacted at email: muhassanhur@gmail.com.

Amal Samir Sedrak Associate professor of Public Health & community Medicine at Faculty of medicine Cairo University and Health Economist at The Unified Procurement Authority (UPA), she obtained a professional Master of Health Economics from Cairo University. She can be contacted at email: amalnewlife82@gmail.com.