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# Health Trends of a Medically Underserved Population Attending an Annual Community Health Fair Throughout the COVID-19 Pandemic

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## Abstract

**Background:** The Mitchell Wolfson Sr. Department of Community Service (DOCS) is a medical student-run organization offering free healthcare to underserved patients in Florida via ten annual health fairs and four weekly clinics. The South Dade Health Fair (SDHF) serves a rural, migrant population with limited access to healthcare. This study analyzes the health metric trends of patients attending SDHF before and during the Coronavirus Disease 2019 (COVID-19) pandemic, offering insight into strategies to improve future interventions.
**Methods:** SDHF was redesigned to maintain operations throughout the COVID-19 pandemic. De-identified data from three pre-pandemic fairs (2017-2019) and three during-pandemic fairs (2021-2023) were extracted from REDCap and analyzed in SPSS using independent samples t-tests ($p<0.05$). Key metrics included blood pressure (BP), glucose levels, body mass index (BMI), lipid profiles, and T-scores.
**Results:** Over six years, 394 patients received care across 467 encounters (291 pre-pandemic, 176 during-pandemic). Most attendees were females (71.1% pre-pandemic, 65.9% during-pandemic). Cohorts were demographically similar except for preferred language and health insurance type. In the during-pandemic cohort, there were significant increases in mean systolic BP (123.5 to 133.4), total cholesterol (176 to 188), low-density lipoprotein (99 to 108), and non-fasting glucose (94.1 to 124.6), and significant decreases in mean high-density lipoprotein (52 to 49) and T-score (0.01 to -0.81). There was a statistically insignificant trend toward an increase in mean BMI between the two cohorts. A sub-analysis of patients who attended pre- and during-pandemic fairs yielded similar results.
**Conclusions:** We successfully organized three student-run health fairs during the COVID-19 pandemic while ensuring patient safety and high-quality health care delivery. Data demonstrate statistically significant changes in parameters that portend worse cardiovascular outcomes in the aggregate cohort and amongst repeat patients. These findings suggest a need for interventions to address hypertension, diabetes, dyslipidemia, and osteoporosis in this community.

## Introduction

South Florida has a large Hispanic population and one of the highest estimated percentages of undocumented immigrants in the United States (US).[1,2] Within Miami-Dade County, Homestead and Florida City are home to a large Hispanic migrant worker community. Individuals residing in less urban settings are more likely to experience poverty, have less formal education, reduced opportunities for employment, and poorer access to health services.[3] In Homestead and Florida City, 23.7% of residents

reported being uninsured in the 2020 census, likely an underestimation given the exclusion of undocumented persons in census data.[1] Even for those with health insurance, this area is populated by few primary care centers, limiting access to basic health screenings and primary care services.[4]

While an imperfect solution, student-run free clinics (SRFCs) mitigate the burden of inadequate health care for underserved patients, serving as an entry point into the healthcare system.[5,6] SRFCs have been associated with improved health outcomes in the populations they serve.[5,6] At the University of Miami Miller School of Medicine (UMMSM), the Mitchell Wolfson Sr. Department of Community Service (DOCS) is a medical-student-run organization that provides free health care to medically underserved patients in South Florida through ten annual health fairs and four weekly clinics. Since 2014, DOCS has held the South Dade Health Fair (SDHF) to serve the communities of Homestead and Florida City. Annually, approximately 100 adults attend SDHF to obtain preventative care services and health screenings.

The onset of the Coronavirus Disease 2019 (COVID-19) pandemic necessitated the indefinite closure of many student-led community health initiatives across the US, including SDHF. As a result, in 2020, patients who relied on this fair were left without access to healthcare providers and routine screenings. Six months into the pandemic, public health experts at UMMSM, DOCS leadership, and community health partners in Homestead and Florida City began deliberation regarding the possibility of hosting a modified SDHF. Ultimately, DOCS reinitiated SDHF operations in early 2021 through a physically distanced model and planning around COVID-19 case predictions. Through these adaptations, DOCS continued to provide care while capturing data about the health of this community throughout the pandemic.

This paper aims to investigate the health trends of SDHF attendees before and after the onset of the pandemic to guide future interventions. We postulate that increased barriers to obtaining care and preventative health measures secondary to the pandemic may have exacerbated existing health issues in this community.

## Methods

SDHF is hosted at a Florida City community center as a collaborative effort between DOCS and community partners. The fair is open to all adults, regardless of insurance, socioeconomic, or immigration status. The fair is staffed by UMMSM medical students, residents, fellows, and supervising faculty. Research Electronic Data Capture (REDCap) (13.8.1, Vanderbilt University, Nashville, TN), a secure, web-based application, is used as an electronic medical record to collect patient health data and contact information.[7] Demographic information, including age, sex, race, ethnicity, preferred language, and health insurance status/type, is collected at each patient encounter. Patients are instructed to select a single response for each demographic category and have the option to decline to answer. Information is then input into REDCap by trained medical student volunteers. As patients participate in the fair, collected health metric data is input in real-time into REDCap by student volunteers, and patients are counseled on their results. At fair checkout, uninsured or high-risk patients are paired with trained medical student navigators for assistance with follow-up care or health insurance applications.[8,9,10]

Following the onset of COVID-19, fairs in 2021-2023 operated on an appointment-only basis, with fair scheduling adjusted and occasionally postponed to avoid case surges. Patient outreach shifted to digital and mailed communication, rather than historical in-person community canvassing. On-site protocols, including outdoor stations, unidirectional station flow, universal symptom screening, temperature checks, and masking, were employed.

The three health fairs immediately before the COVID-19 pandemic onset (2017, 2018, 2019, hereafter referred to as “pre-pandemic fairs”) and the three fairs immediately after the pandemic onset (2021, 2022, 2023, hereafter referred to as “during-pandemic fairs”) were included in the study. A retrospective chart review was performed, and de-identified patient data were extracted from REDCap.

***Table 1.*** Health Metrics, All Patient Encounters (N=467)

| Characteristics | Pre-Pandemic, N= 291 (%) | During-Pandemic, N= 176 (%) |
|---|---|---|
| Age (Mean) | 43.19 | 45.70 |
| Sex | | |
| Male | 84 (28.9) | 60 (34.1) |
| Female | 207 (71.1) | 116 (65.9) |
| Race/Ethnicity | | |
| White (Non-Hispanic) | 14 (4.8) | 7 (4.0) |
| White (Hispanic) | 197 (67.7) | 132 (75.4) |
| Black (African American) | 18 (6.2) | 11 (6.3) |
| Black (Caribbean/Haitian) | 32 (11) | 11 (6.3) |
| Black (Hispanic) | 10 (3.4) | 2 (1.1) |
| Asian/Pacific Islander | 2 (0.7) | 5 (2.9) |
| Native American | 0 (0) | 0 (0) |
| Other | 16 (5.5) | 6 (3.4) |
| Prefer not to say | 2 (0.7) | 1 (0.6) |
| Language | | |
| English | 116 (40.3) | 52 (29.5) |
| Spanish | 155 (53.8) | 113 (64.2) |
| Creole | 15 (5.2) | 5 (2.8) |
| Other | 2 (0.7) | 6 (3.4) |
| Health Insurance | | |
| Medicaid | 135 (47.4) | 5 (1.1) |
| Medicare | 48 (16.8) | 9 (5.1) |
| Private Insurance | 13 (4.5) | 21 (11.9) |
| Jackson Card | 1 (0.4) | 1 (0.6) |
| Uninsured | 78 (27.4) | 114 (64.8) |
| Other | 10 (3.5) | 13 (7.4) |
| Prefer not to say | 0 (0) | 13 (7.4) |

*Table 1 displays the demographic profile of all fair attendees in the pre-pandemic and during-pandemic cohorts. All data is reported as n (%) except for age which is reported as mean. Demographic data represents each patient encounter, rather than individual patients. The sample size N for patient encounters is inconsistent due to the absence of some patient data.*

Health metrics of interest included blood pressure (BP); mean arterial pressure (MAP); fasting or non-fasting glucose depending on patients' fasting status; body mass index (BMI); lipid profile including total cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides; and T-score by wrist bone densitometry. Metrics were limited to those that could be easily obtained in a remote, non-traditional healthcare delivery setting. The above metrics were chosen as they indicate elevated risk for cardiometabolic diseases and osteoporosis, which have a high prevalence in our population.[11]

Each patient encounter, including those of repeat patients who attended multiple fairs in the pre-and during-pandemic cohorts, was included in the primary analysis. A secondary analysis of repeat patients, defined as all patients who attended at least one pre-pandemic fair and one during-pandemic fair, was performed. Data were analyzed in SPSS (29.0.1.1, IBM, Armonk, NY). Categorical demographic variables (sex, race/ethnicity, preferred language, health insurance type) were compared between cohorts using z-tests for proportions. Continuous health metrics were compared using independent samples t-tests. Statistical significance was set at $p<0.05$.

***Table 2.*** Health Metrics, All Patient Encounters (N=467)

| | Pre-Pandemic | | | | During-Pandemic | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | n | Mean | Median | SD | n | Mean | Median | SD | p-value |
| MAP | 291 | 93.3 | 92.6 | 11.1 | 176 | 97.4 | 94.1 | 15.4 | **<0.001** |
| Systolic BP | 291 | 123.4 | 120.0 | 15.5 | 175 | 133.3 | 129.5 | 22.3 | **<0.001** |
| Diastolic BP | 291 | 78.0 | 80.0 | 11.1 | 175 | 80.2 | 77.0 | 13.7 | 0.516 |
| HDL | 235 | 52 | 49 | 17 | 171 | 49 | 46 | 12 | **0.032** |
| LDL | 212 | 99 | 100 | 36 | 159 | 108 | 105 | 42 | **0.02** |
| Triglycerides | 229 | 140 | 124 | 74 | 162 | 150 | 132 | 82 | 0.233 |
| Cholesterol | 228 | 176 | 174 | 41 | 170 | 188 | 183 | 49 | **0.014** |
| Fasting Glucose | 141 | 97.3 | 93.0 | 23.4 | 94 | 102.3 | 90.0 | 43.3 | 0.156 |
| Random Glucose | 115 | 94.1 | 95.0 | 47.6 | 77 | 124.5 | 99.0 | 68.2 | **<0.001** |
| T-Score | 75 | 0.01 | -0.2 | 1. 3 | 86 | -0.81 | -0.9 | 1.8 | **<0.001** |
| BMI | 290 | 28.6 | 27.4 | 5.7 | 176 | 29.5 | 28.6 | 5.9 | 0.051 |

*Table 2 displays the health metrics of interest across all patient encounters in the pre-pandemic and during-pandemic cohorts. Bold values indicate statistical significance, p<0.05. The sample size N for patient encounters is inconsistent due to the absence of some patient data. SD: standard deviation. MAP: mean arterial pressure; BP: blood pressure; HDL: high density lipoprotein; LDL: low density lipoprotein; BMI: body mass index.*

***Table 3***. Health Metrics, Repeat Patient Encounters (N=80)

| | Pre-Pandemic | | | | During-Pandemic | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | n | Mean | Median | SD | n | Mean | Median | SD | p-value |
| MAP | 38 | 90.6 | 90.1 | 10.8 | 41 | 93.3 | 76.8 | 12.4 | **0.042** |
| Systolic BP | 39 | 120.2 | 122 | 14.5 | 41 | 131.5 | 126 | 21.6 | **0.004** |
| Diastolic BP | 39 | 75.8 | 78 | 10.7 | 41 | 79.1 | 78 | 9.7 | 0.072 |
| HDL | 34 | 49.7 | 48 | 11.9 | 41 | 45.6 | 44 | 9.3 | 0.053 |
| LDL | 31 | 100.4 | 100 | 32.7 | 40 | 103.8 | 104 | 36.7 | 0.345 |
| Triglycerides | 34 | 138.3 | 139 | 61.9 | 40 | 142 | 133 | 56.2 | 0.396 |
| Cholesterol | 31 | 180 | 174 | 38.8 | 41 | 176 | 172 | 40.8 | 0.344 |
| Fasting Glucose | 22 | 101 | 90.5 | 31.3 | 18 | 103.7 | 103 | 23.7 | 0.383 |
| Random Glucose | 13 | 97.4 | 102.2 | 13.59 | 21 | 107.4 | 97 | 27.7 | 0.171 |
| T-Score | 14 | 0.16 | 0.1 | 1.25 | 21 | -1.00 | -0.9 | 1.00 | **0.003** |
| BMI | 39 | 28.6 | 26.8 | 6.4 | 41 | 31 | 29.2 | 7.4 | 0.063 |

*Table 3 displays the health metrics of interest for repeat patients who attended a minimum of at least one fair in both the pre-pandemic and during-pandemic cohorts. Bold values indicate statistical significance, p<0.05. The sample size N for patient encounters is inconsistent due to the absence of some patient data. SD: standard deviation; MAP: mean arterial pressure; BP: blood pressure; HDL: high density lipoprotein; LDL: low density lipoprotein; BMI: body mass index.*

## Results

Over six years, 394 unique patients received care across 467 encounters (291 pre-pandemic, 176

during-pandemic). The 2017, 2018, and 2019 fairs served 58, 117, and 116 patients, respectively, while the 2021, 2022, and 2023 fairs served 67, 52, and 57 patients, respectively. Table 1 displays the demographic profile of fair attendees by cohort (pre-pandemic vs. during-pandemic). Most fair attendees were female (71.1% pre-pandemic, 65.9% during-pandemic) with an average age of 43 years pre-pandemic and 46 years during-pandemic. The two cohorts had a statistically significant difference in their preferred language and health insurance coverage but were demographically similar regarding age, sex, and race/ethnicity. There was a 10.4% increase in the number of Spanish-speaking patients in the during-pandemic cohort ($p<0.05$). Medicaid and Medicare coverage was significantly higher in the pre-pandemic cohort ($p<0.05$). The during-pandemic cohort had a significant increase in the number of uninsured individuals ($p<0.05$).

Table 2 display the pre- and during-pandemic health metrics of interest for all patient encounters. Mean systolic BP increased by approximately 10 ($p<0.001$) and MAP increased by approximately 4 ($p<0.001$) in the during-pandemic cohort. Similarly, total cholesterol increased by 12 ($p=0.014$), LDL increased by 9 ($p=0.020$), HDL decreased by 3 ($p=0.032$), and random glucose increased by 30.5 ($p<0.001$) following the pandemic onset. T-scores significantly decreased from 0.01 to -0.81 ($p<0.001$). There was a statistically insignificant trend toward increased BMI between the two cohorts.

Table 3 display a comparison of health metrics for all repeat patients. There were statistically significant increases in systolic BP by approximately 11 ($p=0.004$) and MAP by approximately 3 ($p=0.042$) after the pandemic onset. There was a significant decrease in T scores from 0.16 to -1.00 ($p=0.003$). There was a statistically insignificant trend toward increased BMI and random glucose and decreased HDL between the two cohorts.

## Discussion

We sought to retrospectively evaluate trends in health metrics of patients attending SDHF before and during the pandemic. We identified significant changes in parameters that portend worse health outcomes in the during-pandemic cohort, including increases in systolic BP, total cholesterol, LDL, non-fasting glucose and significant decreases in HDL and T-scores. Similar findings were obtained in a subgroup analysis of patients who attended fairs in both cohorts. While the cohort of repeat patients is small and the increased mean age of the during-pandemic cohort may contribute to the above findings, it is reasonable to consider that the data may extrapolate to the entirety of the cohort and suggest a true worsening of these metrics.

Clinically, these metrics signify increased risk of cardiovascular events, diabetes and its associated complications, osteoporosis, and overall mortality.[12] For instance, a 10 mmHg increase in systolic BP is linked to a 2.16-fold increase in the risk of hypertensive heart disease and a 1.63-fold increase in

the risk of ischemic stroke.[12] Furthermore, a 1 mmol/L increase in total cholesterol is associated with a 1.44-fold increase in the risk of ischemic heart disease.[12] An increase in random glucose of 18 mg/dL is associated with a 2.01-fold increase in the risk for retinopathy, a 2.15-fold increase in the risk for neuropathy, a 1.58-fold increase in the risk for diabetic nephropathy, and a 1.49-fold increase in the risk for myocardial infarction.[13] Additionally, a decline in T scores from 0.01 to -0.81 represents decreasing bone mineral density, which raises the risk of fragility fractures and subsequent fracture-related morbidity, including pain and disability.[14]

SRFCs are critical to addressing disparities in communities with limited resources as they connect the community with an initial point of access to primary care.[5,6,15] The onset of the COVID-19 pandemic impacted community health efforts across the country, deepening pre-existing health inequities among vulnerable populations, including individuals of low socioeconomic status and migrant and rural communities.[16-18] Widespread delays in care due to the closure of traditional health care delivery settings limited access to screening, diagnostic services, and treatment.[16-21] Additionally, concerns about the transmission of COVID-19 contributed to reduced usage of medical services, with

an estimated 41% of US adults reporting that they delayed or avoided care for this reason.[16,22,23] Minority racial and ethnic populations were especially impacted, with findings suggesting that Hispanic adults sought out less medical care during the pandemic than their non-Hispanic counterparts.[16] In addition to limited healthcare access, the pandemic introduced financial strain and resource shortages. Individuals from the lowest socioeconomic groups, including rural and migrant populations, experienced greater rates of income instability, food insecurity, and loss of employment and health insurance.[24,25] At baseline, these populations were already at greater risk for health complications due to higher rates of poverty, lower education levels, and fewer employment opportunities.[26] Supply chain issues resulted in rising grocery prices and the closure of local restaurants, gyms, and green spaces reduced food options and opportunities for exercise within communities.[27] We postulate that a summative effect of all these factors was the primary driving force for the trends in health metrics observed in our population.

Our results highlight opportunities for intervention that can be tailored to the needs of the community we serve. Numerous studies have demonstrated that patient education interventions during student-run health fairs can improve health knowledge and lead to measurable improvements in clinical metrics, including lower total cholesterol, systolic blood pressure, and hemoglobin A1c.[28-30] Given this, one potential strategy could be integrating patient education within each fair station to increase health literacy surrounding hypertension, diabetes, dyslipidemia, and osteoporosis. For example, volunteers could explain risk factors and diagnostic criteria for diabetes while testing a patient's glucose and discuss the importance of weight-bearing exercise and calcium and vitamin D supplementation while performing bone densitometry. In this way, patients can be equipped with knowledge regarding the screening they are receiving and steps they can take to promote better health. Another useful strategy could be the initiation of longitudinal, virtual education campaigns to target the community year-round. Several studies have demonstrated that video education tools are effective in improving knowledge acquisition and skills development across a variety of chronic illnesses, including diabetes and hypertension.[31,32] DOCS has a pre-developed series of patient education videos that could be disseminated virtually, thereby serving as a low-cost, low-effort initiative to maintain community rapport and provide additional education. Lastly, we may also consider expanding our criteria for patient navigation to target patients who are at risk of developing conditions like diabetes, hypertension, or osteoporosis. Analyses of outcomes from our home-grown patient navigation program and other student-led programs have demonstrated that these initiatives are successful in helping patients adhere to recommended treatments, engage in preventative behaviors, and attend follow-up care.[8, 9,10,33]

It is essential that SDHF and other SRFCs continue to operate to offer patients health screenings, access to providers, and navigation to obtain formal healthcare via enrollment in Medicaid or state-funded programs. Our goal is to enable our patients to no longer need our services, as they have been formally connected with traditional healthcare delivery.[8, 9,10] We hope that the low number of repeat patients in our cohort suggests that we may be at least partially successful in achieving this aim. Alternatively, it may be possible that individuals who lost their jobs and health insurance because of the pandemic were more motivated to pre-register for health fairs and obtain one of the limited appointment slots, thereby increasing the number of new patients in the during-pandemic cohort.

*Limitations*

There are several limitations of this study. It is possible that former patients avoided attending fairs after the pandemic, whether due to fear of contracting COVID-19, lack of awareness regarding the fair, or reduced trust following fair delays, resulting in an inability to capture the full effect of the pandemic on health metrics. Another limitation is missing or incomplete data within the REDCap database as well as the small sample size. Though we carefully screened the data, difficulties in linking patients to existing records are common, given the structure of the database. Similarly, DOCS health fairs are run by medical student volunteers, who are in different stages of clinical training and may

face barriers in communicating with patients. For instance, in our cohort, fasting glucose values are greater than random glucose, potentially secondary to unclear questions from student volunteers regarding fasting status and low health literacy among some patients. However, it is also possible that patients with diabetes attended fairs in the fasting state compared to those without any comorbidity, who may attend non-fasting. We also recognize the potential for sampling bias given the larger proportion of uninsured patients in the during-pandemic cohort, who may represent a different demographic group with distinct health needs or access challenges, potentially influencing the observed outcomes. Furthermore, DOCS operates entirely on donations and in non-traditional healthcare delivery settings, which limits the health metrics that we can capture. Despite these limitations, this study sheds important insight into the impact of COVID-19 on community health.

## Conclusion

SDHF serves an important role in supporting the communities of Homestead and Florida City. This study highlights the potentially detrimental impact of the pandemic on the health of patients attending SDHF, with findings that translate beyond our fair. Through our model, we were able to capture health data for patients traditionally excluded from research, such as migrant workers and undocumented immigrants, while protecting their anonymity.[34] Our work prompts future investigation into mechanisms to improve our data entry to obtain more robust and complete data sets. Our findings emphasize the potential value of developing multifaceted, longitudinal interventions to supplement the work that is completed during the one-day annual fair. Lastly, in our methods, we offer a description of how other SRFCs can safely and effectively continue to host annual health fairs amidst a global pandemic. As novel infectious pathogens continue to evolve and emerge, threatening the health of our communities, community health providers who care for the medically underserved must remain prepared to adequately support patients despite the challenges imposed by a pandemic.

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#### Disclosures

The authors have no conflicts of interest to disclose.

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