



# The Trend of Nutritional Adequacy and Nutritional Routs among Imam Reza Teaching Hospital: A NutritionDay Review in 2019-2021

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ARTICLE INFO	ABSTRACT
<p><i>Article type:</i> Research Paper</p> <hr/> <p><i>Article History:</i> Received: 30 Dec 2023 Accepted: 02 Jan 2024 Published: 15 Jan 2024</p> <hr/> <p><i>Keywords:</i> Nutritional adequacy Nutritional routs NutritionDay</p>	<p><b>Introduction:</b> Adequate nutrition is essential for the well-being of hospitalized patients. Assessing nutritional adequacy significantly affects patient-centered care. The nutritionDay (nDay) project, supported by ESPEN, conducts a global audit to evaluate nutritional risks. Imam Reza Teaching Hospital in Mashhad is one of the participating hospitals. This study examined the trend of nutritional adequacy in Imam Reza Teaching Hospital from nDay 2019 to 2021.</p> <p><b>Method:</b> This cross-sectional study analyzed data collected from the nDay database of Imam Reza Teaching Hospital in Mashhad, Iran, between 2019 and 2021. Written consent was obtained, and the study followed international standards and the nDay questionnaire. Factors such as nutritional routs, energy goals, and energy intake were considered. All statistical analyses were performed using the Statistical Package for Social Sciences version 19.0. The three-year trend of nutritional adequacy was compared using the Chi-Square test.</p> <p><b>Result:</b> A total of 414 patients from 14 departments of Imam Reza Hospital were included in the study during 2019-2021. There was no significant trend of energy goal among the wards during 2019-2021, except in women's burn, orthopedic surgery, and general surgery wards (<math>P &lt; 0.001, &lt; 0.001, &lt; 0.001</math>, respectively). There was a significant variation in energy intake during 2019-2021 in men's burn, oncology, cardiac surgery, gynecology surgery, and general surgery wards (<math>P &lt; 0.001, &lt; 0.001, &lt; 0.001, &lt; 0.001, &lt; 0.001</math>, respectively).</p> <p><b>Conclusion:</b> This study showed that burn and oncology patients did not achieve their energy goals, indicating the importance of nutritional care.</p>

► Please cite this paper as:

Bateni M, Hassan-zadeh M, Khadem-Rezaiyan M, Golzar M, Norouzy A, Alinezhad-Namaghi M. The Trend of Nutritional Adequacy and Nutritional Routs among Imam Reza Teaching Hospital: A NutritionDay Review in 2019-2021. *J Nutr Fast Health*. 2024; 12(1): 51-57. DOI: 10.22038/JNFH.2024.77179.1491.

## Introduction

Nutrition is crucial to individuals' overall health and well-being, particularly those receiving medical care in hospitals (1). In the most critically ill patients, there is a difference between the amount of nutrients needed and the amount consumed. According to previous studies, low-calorie intake is associated with worse outcomes (2). Proper and sufficient nutrition is necessary for the patient's health and recovery in managing a hospitalized patient and medical procedures. Adequate nutrition supports recovery, improves patient outcomes,

and contributes to healthcare quality (3). Monitoring and improving nutritional adequacy have become essential aspects of healthcare delivery with an increasing emphasis on patient-centered care (4). Insufficient food intake in patients leads to the risk of chronic conditions, including malnutrition. Previous studies have shown that malnutrition affects 20-50% of hospitalized patients (5). Malnutrition has costs for the patient and the hospital, which leads to more use of resources and increased costs associated with longer hospital stays and may lead to increased mortality, pressure ulcers, and

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infections (6). Moreover, studies have indicated that the need for energy and protein increases during most acute illnesses (7).

Different nutritional routes based on the patient's clinical conditions include oral intake, Oral Nutrition Supplements (ONS), fortified/enriched food, enteral nutrition, and parenteral nutrition. The initial approach for the patient should prioritize oral nutrition. Implementing oral nutritional support, such as ONS and fortified/enriched food, can enhance clinical outcomes. Enteral nutrition should be considered when the calorie intake is inadequate or oral nutrition is not feasible. Enteral nutrition is preferred over parenteral nutrition due to its lower risk of infectious and non-infectious complications. Ultimately, parenteral nutrition is considered for patients with contraindications for oral and enteral nutrition (8).

Nutritional adequacy is the intake of essential nutrients to meet nutritional needs and prevent malnutrition (9), obtained from comparing the need for specific nutrients and their intake in a person or population (10). There are several criteria to define nutritional adequacy, which are related to preventing deficiency diseases, preventing chronic diseases related to nutrition, reducing the risk of diet-related diseases, clinical health related to nutrition identified by biochemical tests, and maintaining physiological balance (9).

nDay is a yearly one-day cross-sectional audit of hospital wards and nursing homes (11). NutritionDay started in Iran in 2010 and has been continuously implemented every year in

Mashhad since 2019 (11). This study aimed to evaluate the trend of nutritional adequacy and nutritional routs in Imam Reza Teaching Hospital from 2019 to 2021.

## Materials & Methods

This cross-sectional study used the data from the nDay database of Imam Reza Teaching Hospital. The energy intake and energy goals were used to analyze the trend of nutritional adequacy.

All statistical analyses were performed using the Statistical Package for Social Sciences version 19.0 (SPSS Inc., Chicago, IL, USA). The Kolmogorov-Smirnov test was used to assess the variables' normal distribution, and the variables' frequency was expressed with descriptive analysis. The three-year trend of nutritional adequacy was compared using the Chi-Square test.

The Research Ethics Committee of Mashhad University of Medical Sciences approved the study protocol (IR.MUMS.MEDICAL.REC.1402.371).

## Results

The study population included adult patients (n=414, 49.3% male, with a mean age of 44.20 years, range 12 – 81 years old) from 14 units of Imam Reza Teaching Hospital in Mashhad, Iran. Table 1 demonstrates basic information on the study population. The lowest BMI in 2019 and 2021 was related to the oncology ward, associated with the orthopedic surgery ward in 2020.

**Table 1.** Basic information on study population among 2019-2021

Ward Name	2019				2020				2021			
	Number	Age (Min-Max)	Weight	BMI	Number	Age (Min-Max)	Weight	BMI	Number	Age (Min-Max)	Weight	BMI
Burn Female	10	36 (24-40)	65.4±18.1	25.6±6.2	8	38(31-52)	60.4±11.6	23.1±4.8	10	40 (12-43)	61±24.1	25.3±5.2
Burn Male	9	29 (23-36)	57.8±8.6	19.9±2.5	8	29 (19-37)	68.3±18.8	22.8±6.1				
Internal Medicine/Gastroenterology	17	60 (54-65)	60.3±16.2	23.4±5.9					15	55 (50-62)	64.5±11	22.9±2.7
General Internal	19	64 (56-75)	65.6±15.2	23±4.9					20	58 (47-71)	67.9±14.8	25±5.1
Internal medicine/oncology	9	25 (19-31)	59.7±11.1	18.9±2.4					24	45(25-52)	63.2±11.4	25.6±11.1

Ward Name	2019				2020				2021			
	Number	Age (Min-Max)	Weight	BMI	Number	Age (Min-Max)	Weight	BMI	Number	Age (Min-Max)	Weight	BMI
Internal Med	23	73 (59-81)	65.4±13.7	24.4±5.5					22	62 (49-70)	67.8±14.4	24±4.8
Surgery-General	30	47 (36-64)	65.1±15.5	23.6±5.0	11	33 (30-39)	70.5±15.3	25.6±6.4	24	42 (33-53)	70.5±11.4	25.7±3.6
Gynecology Surgery	10	43 (37-45)	78±13.5	30±5.3	10	29 (22-35)	72.6±14.2	28.9±5.3	20	31 (27-34)	71.9±13.4	30.7±12.2
Orthopedic Surgery	40	46 (27-59)	66.2±16	23.7±4.4	10	33 (24-53)	63.8±15.6	22.4±5.2	33	44 (30-53)	67.4±14.7	24.7±4.8
Urology	14	58 (40-61)	69.5±14.2	23.7±4.5					18	55(43-63)	68.6±11.7	24.7±4.3

Figure 1 shows the frequency variation of nutritional routes between 2019-2021. Patients from male burn and urology wards received regular hospital food in 2019. In addition, all

hospitalized patients in men’s burn and general Internal wards had regular hospital food in 2020 and 2021, respectively.

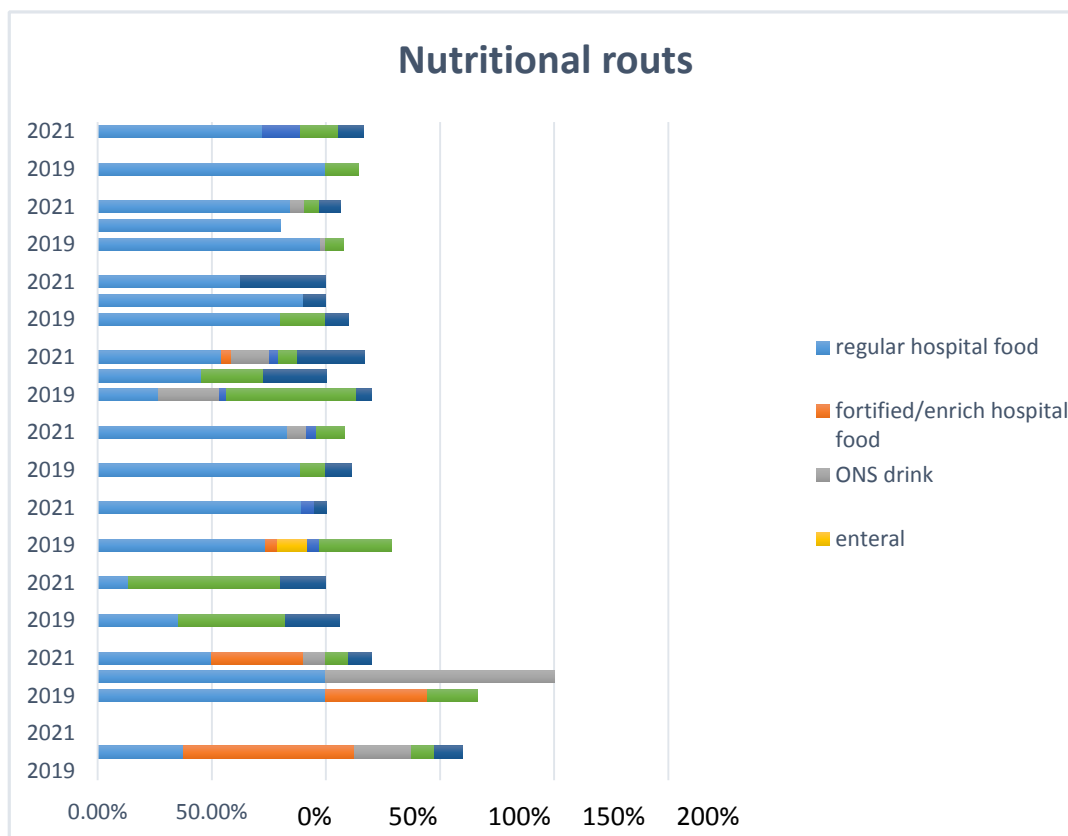


Figure 1. Nutritional routs during 2019-2021

The men’s burn ward had the highest prevalence of fortified/enriched hospital food (44.4%) in 2019, followed by women’s burn (75%) in 2020 and men’s burn (40%) in 2021.

Regarding oral nutrition supplementation, the general surgery ward had the highest frequency (26.7%) in 2019, followed by the men’s burn ward (100%) in 2020 and the general surgery ward (16.7%) in 2021.

Enteral nutrition was applied in 13% of the general internal medicine ward patients in 2019. There was no report of enteral nutrition in nDay 2020 and 2021.

In addition, parenteral nutrition was reported in 5.3% of general internal medicine ward patients.

There was no report of parenteral nutrition among patients evaluated in nDay 2020. However, urology was the most prevalent ward regarding parenteral nutrition in nDay 2021 (16.7%).

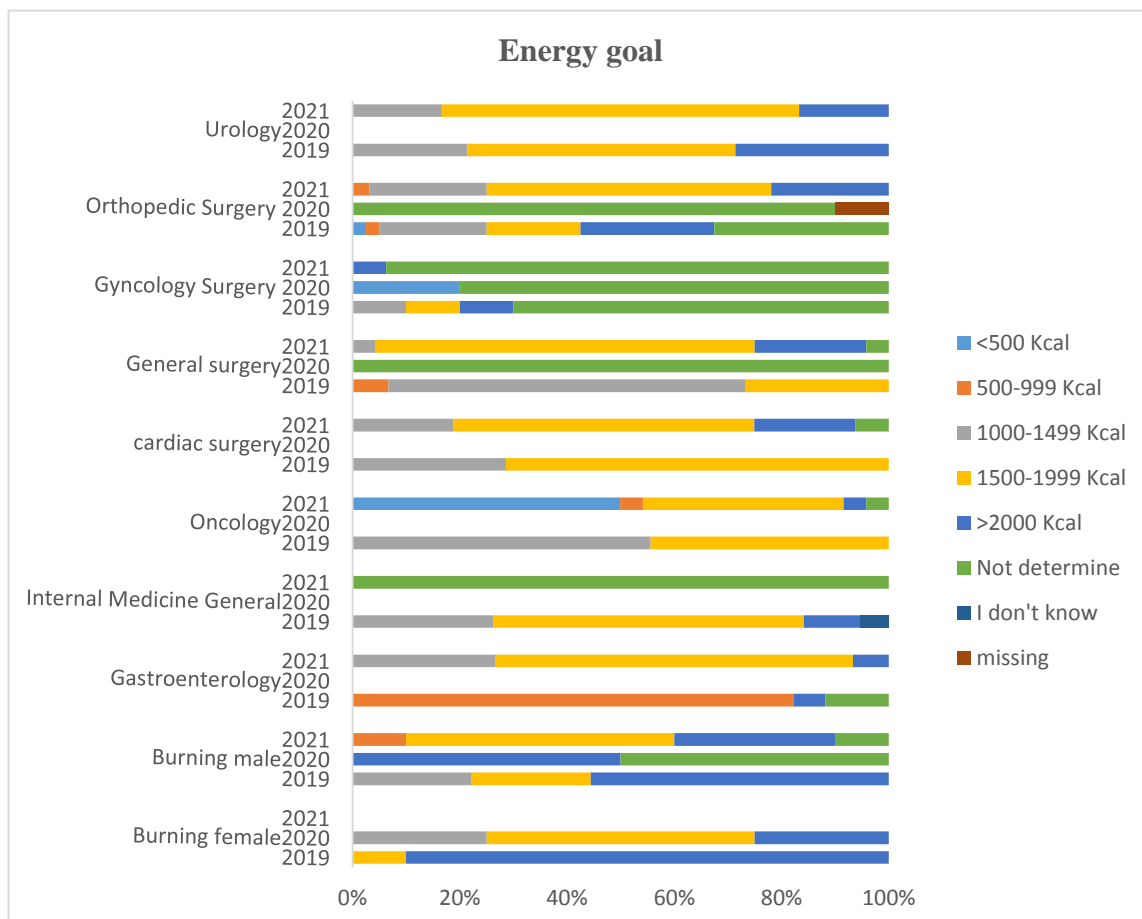


Figure 2. Trend of energy goal during 2019-2021

The trend of energy goals during 2019-2021 is demonstrated in Figure 2. There was no significant variation in energy goals among the wards during 2019-2021, except in women’s burn, orthopedic surgery, and general surgery wards ( $P < 0.001$ ,  $< 0.001$ , and  $< 0.001$ , respectively). The highest frequency of  $< 500$  kcal energy goal was reported for the gastroenterology ward (82.4%) in 2019, the gynecology surgery ward (20%) in 2020, and the oncology ward in 2021 (50%). The highest frequency of  $> 2000$  kcal energy goal was related to the women’s burn ward in 2019 (90%), while it was reported in the men’s burn ward in 2020 and 2021 (50% and 30%, respectively).

Figure 3 presents the trend of energy intake during 2019-2021. There was a significant variation in energy intake during 2019-2021 in men’s burn, oncology, cardiac surgery, gynecology surgery, and general surgery wards ( $P < 0.001$ ,  $< 0.001$ ,  $< 0.001$ ,  $< 0.001$ , and  $< 0.001$ , respectively).

The highest frequency of  $< 500$  kcal energy intake was reported in the cardiac surgery ward (28.6%) in 2019, while it was related to gynecology surgery (10%) and oncology (50%) in 2020 and 2021, respectively. The oncology ward had a high prevalence (66.7%) of energy intake in the range of 500- 999 kcal in 2019, and it was observed in women’s burn (62.9%) and

orthopedics surgery ( 34.4%) in 2020 and 2021. For the range of 1000-1499 kcal energy intake, the high frequency was reported in the general surgery ward (63.3%) in 2019, but it was related to women’s burn (37.5%) and orthopedics surgery (25%) in 2020 and 2021 respectively. The highest frequency for energy intake ranging from 1500-2000kcal was reported in the gynecology surgery ward, with a

frequency of 70% and 10% in 2019 and 2020, respectively. However, the highest frequency of energy intake in this range was reported in the cardiac surgery ward (54.2%) in 2021. Furthermore, the gastroenterology ward was the most prevalent ward for energy intake >2000 kcal (41.2%) in 2019, and it was related to the men's burn ward (50% and 20%, respectively) in 2020 and 2021.

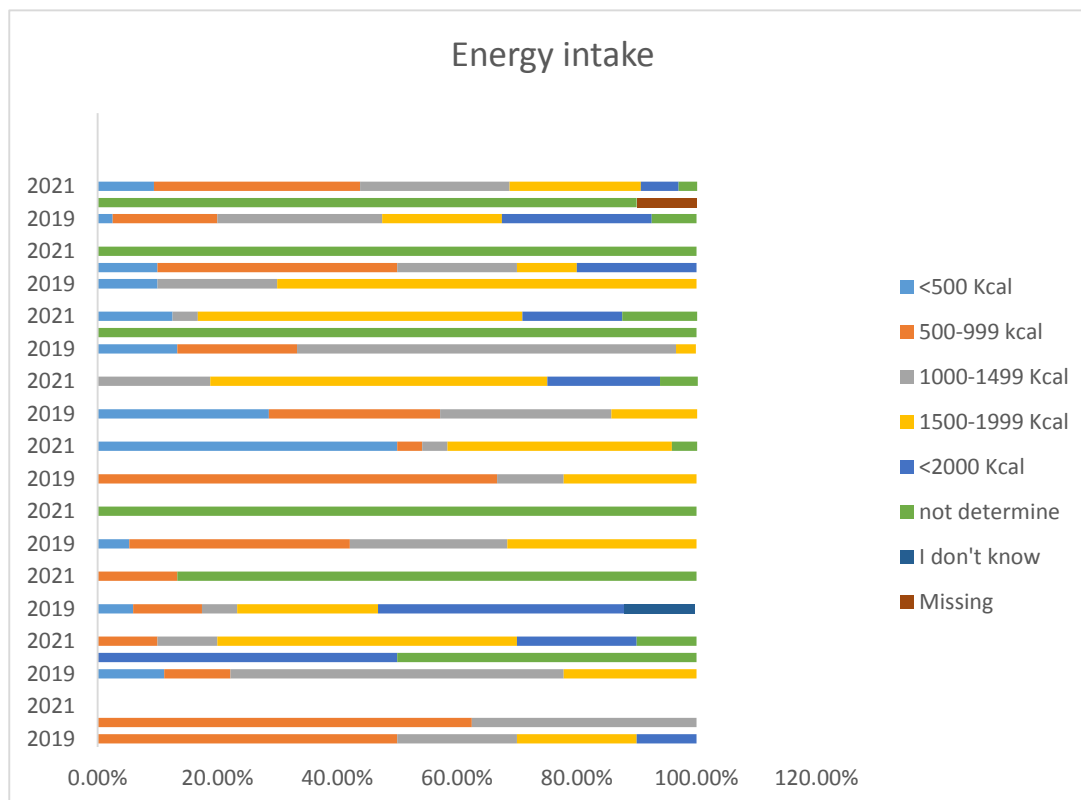


Figure 3. Trend of energy intake during 2019-2021

**Discussion**

There was no specific trend for energy intake and energy goal, but there was a significant variation in energy intake and energy goal between 2019 and 2021. The lowest energy goal was reported in patients of the gastroenterology ward. In addition, the most insufficient energy intake was reported in patients in oncology and women's burn wards. Among the hospital wards, a high percentage of patients in the women’s burn and men’s burn wards had regular hospital food, fortified/enriched hospital food, and oral nutrition supplements. The general internal medicine ward reported the highest prevalence of enteral nutrition. The highest frequency of <500 and >2000kcal energy goals were reported

for gastroenterology and women’s burn wards, respectively. A high frequency of <500 and >2000kcal energy intake was reported in gynecology surgery and men’s burn wards, respectively. The lowest BMI was related to the patients in the oncology ward.

Saure et al. (2019) showed that a high percentage of patients (22.7%-38.7%) received a special diet 5.3% of patients received oral nutrition supplement (ONS) in combination with special food, and 0.3% of patients received alone, and 7.3% of patients received enteral or parenteral or combination enteral-parenteral nutrition (12). Another study conducted in 2016 showed that 44% of patients receive nutritional support, and among the types of nutritional routes,

parenteral nutrition had a higher prevalence than other routes (13). Hiesmeyer et al. reported that 59% of patients received a regular hospital diet, 15% received an enriched diet, 2% received protein-energy supplements, and 9% received enteral or parenteral nutrition (14). There were contradictory studies related to the nutritional routs, which can be due to reasons including the strategy of diet therapy at the hospital level, the strategy of diet therapy at the national level, the socio-economic development conditions of the country, and the hospital level.

Several studies have shown inadequate nutritional intake among oncology patients. The prevalence of malnutrition among them was 30.9%. Oral food intake of oncology patients was often insufficient due to appetite and factors affecting it, such as nausea, vomiting, and change in sense of taste. A previous study (on behavior and dietary knowledge among inpatients in oncology wards) indicated that the daily energy intake is significantly lower than the energy goal. Further, hospitalized patients consumed only 65.3% of their daily energy requirement. Nausea, anorexia, vomiting, and change in taste were among the most critical factors affecting appetite, which accounted for 68% (15). Bye et al. (2016) conducted another study on changes in inflammatory biomarkers and energy intake in cancer patients. This study showed that the median energy intake of the patients was 26.2 kcal/Kg, which decreased to 23.7 kcal/Kg during the 12-month follow-up (16). Another study on food intake, readmission, and length of stay of oncology patients showed that only 9.1% of the patients received their energy needs by consuming the main meal. The patients who were at risk of malnutrition ( $MST \geq 2$ ) consumed less energy compared with normal-nourished patients (17).

In the present study, oncology patients had the lowest body mass index. Low energy intake was observed in oncology patients, and low energy intake and low BMI can be caused by anorexia following illness and treatment.

Some studies have demonstrated macronutrient and micronutrient deficiency in burn patients. Khorasanchi et al. (2018) studied burn patients' nutritional needs and actual intake and demonstrated a significant difference between energy intake and required energy (18). Another study was conducted in 2022 on the relationship between biochemical indicators and food intake

with wound healing in burn patients and showed that energy intake is much less than the recommended energy goal. This same applies to protein intake, as 87% of patients didn't receive their required energy and protein (19).

Like other studies, the present study showed that energy intake was much less than the energy goal in burn patients. In burn patients, the energy goal increases due to increased catabolism and the nature of diseases.

Despite numerous screening tools, patients have had insufficient food intake during the last few decades. Inadequate food intake leads to malnutrition and leads to adverse outcomes, including increased length of hospital stay and mortality. Screening at the beginning of admission to identify patients needing medical nutritional therapy may improve patient outcomes (20, 21).

## Conclusion

Based on the results, burn and oncology patients did not consume their energy goal, indicating the importance of nutritional care in these patients. Moreover, oral and enriched nutrition strategies and ONS were more common in burn patients.

## Declarations

### Conflict of Interest

The authors declare no conflict of interest.

### Funding

This work was founded by Mashhad University of Medical Science (MUMS), Iran (Project Number: [4020935](#))

### Ethical Approval

This study was conducted following the guidelines laid down in the Helsinki Declaration. The Research Ethics Committee of Mashhad University of Medical Sciences approved all procedures on human volunteers (IR.MUMS.MEDICAL.REC.1402.371).

### Limitation and Strength

This study used a standard questionnaire to evaluate the patient's nutritional status and food intake. Moreover, the questionnaires were completed by experts or nutrition students. The trend report during consecutive years helps to provide better nutritional care.

The limitation of the present study is the use of a cross-sectional study design. In addition, the total number of non-COVID-19 patients who

could be evaluated was around 50 due to the COVID-19 pandemic 2020.

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