

# Trends in the performance of Syrian physicians in the National Resident Matching Program® Between 2017 and 2019

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## ABSTRACT

**Purpose:** International medical graduates (IMGs) make up one-fourth of the physician workforce in the US and a significant proportion of them come from Syria. The aim of this study was to assess the performance of Syrian physicians seeking residency positions in the US and to examine the effects of visa restrictions on their Match outcome. **Methods:** An online survey administered to IMGs from Syria was used to probe their residency application characteristics as well as their experiences with visa restrictions. We evaluated the factors that affected their Match outcome and number of interviews offered to applicants. **Results:** A total of 223 IMGs from Syria completed the survey with an average match rate of 70.4% (76.6% in 2017 vs. 69.9% in 2018 vs. 64.4% in 2019). The proportion of applicants who required visas was 29.2%. In a multivariate analysis, higher USMLE Step 2CK score increased the match rate, whereas requiring a visa and failure in any USMLE exam decreased the match rate. Among those requiring visa, the match rate decreased from 78.6% in the cycle before the travel ban (2017) to 64.9% in the cycles following the travel ban (2018 and 2019) ( $P = 0.22$ ). Similarly, the total number of interviews offered to these applicants decreased significantly following the travel ban (9.4 [7.5] vs. 6.2 [5.3],  $P = 0.04$ ). **Conclusion:** Syrian IMGs seeking residency positions in the US have a higher match rate than non-US IMGs. Requiring a visa and failing any USMLE exam negatively impacted the match rate and number of interview invitations to Syrian applicants.

**Key words:** IMG, match, residency, Syrian

## INTRODUCTION

Physicians who are international medical graduates (IMGs) apply every year to the National Resident Matching Program® (NRMP®) seeking postgraduate positions in US residency programs. Recent projections by the Association of American Medical Colleges (AAMC) showed that physician shortages will increase by a huge margin by 2030 (40,800–104,900 physicians), which means that there is a need to meet this growing deficit.<sup>[1]</sup> Although the number of medical schools and corresponding class sizes are increasing in the US, they will not be enough to fill the widening gap. IMGs have been filling the physician shortages in the US for several decades.

In fact, IMGs make up one in four physicians-in-training serving as residents or fellows in US hospitals.<sup>[2]</sup> IMGs filled 21.8% of the total number of offered first-year postgraduate positions in the 2019 Match cycle and had comprised 22.7% of actively licensed physicians in 2016.<sup>[3,4]</sup>

Syria, which was recently one of the countries specified for travel and visa restrictions, supplied a large number of

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physicians to the US residency and fellowship programs.<sup>[5]</sup> These IMG physicians also provide care to patients in urban as well as rural areas following training—areas that are severely underserved.<sup>[6]</sup> In 2016, there were 2745 actively licensed physicians in the US who graduated from the University of Damascus alone, which is one of 10 medical schools in Syria.<sup>[4,7]</sup> In that year, University of Damascus was among the top 10 international medical schools supplying physicians into the medical workforce of the US. Despite visa restrictions, Syrian physicians continue to seek residency positions in the US. With much confusion and anecdotally reported difficulty facing them, no evidence exists probing such difficulties and their effects. The aim of this study was to assess the performance of Syrian physicians and graduates of Syrian medical schools in the NRMP® and to identify the main factors affecting their Match outcome.

## METHODS

### Study design and participants

We conducted a cross-sectional study of Syrian physicians and graduates of Syrian medical schools who applied to the 2017, 2018, and 2019 Main Residency Match cycles. We reached out to potential participants through electronic communication and social media platforms with the help of the Syrian American Medical Society's (SAMS) Education Committee. SAMS is a nonpolitical nonprofit professional medical organization founded by Syrian–American physicians practicing in the US.<sup>[8]</sup> SAMS also provides medical relief to people who are affected by the crisis in Syria and neighboring countries. The Education Committee of SAMS provides educational material and workshops to Syrian and non-Syrian medical students and graduates applying to the Main Residency Match.

### Data collection

Participants completed an online survey devised by the study team. The survey was administered anonymously using Google Forms and was disseminated using social media (Facebook). Data were collected and managed using Microsoft Excel. The survey included items on participants' USMLE scores, medical school, year of graduation, US clinical experience, number of interviews received, Match result, immigration status in the US, and required visa category selected on their Match application. Personal information and identifiers were not collected.

### Statistical analysis

Dichotomous data were reported as proportions and continuous data were reported as means and standard deviation (SD). Univariate analyses were performed using chi-squared test or Student's *t*-test as appropriate.

A multivariate logistic regression analysis was performed to examine the main factors that affect the match rate, including visa requirements. We also created a multivariate linear regression model to evaluate the main factors associated with the number of interviews offered to Syrian applicants. The primary outcome of the study was the match rate of physicians over the years specified. Secondary outcomes included the number of interviews offered to applicants and number of programs ranked by applicants. The data were analyzed using STATA/IC software version 14.2 (StataCorp, College Station, TX).

## RESULTS

### Performance in the Match 2017–2019

A total of 223 participants completed the survey (77 in 2017, 73 in 2018, and 73 in 2019) with an average match rate of 70.4% (76.6% in 2017 vs. 69.9% in 2018 vs. 64.4% in 2019). The majority of applicants (46.6%) graduated from medical school within three to five years of applying to the residency Match and 65.5% of them were first-time applicants. The mean (SD) USMLE Step 1 and Step 2CK scores for applicants were 233.0 (20.3) and 234.9 (17.7), respectively. Applicants with elective rotation (hands-on) clinical experience comprised 44.4%, whereas applicants with observer/externship experience comprised 66.8%. The proportion of applicants who required visas was 29.2% (36.4% in 2017 vs. 28.8% in 2018 vs. 21.9% in 2019). The mean number of interviews received by applicants and number of ranked programs were 7.9 (7.0) and 7.2 (6.1), respectively. A summary of the Syrian applicants' characteristics is shown in Table 1 and Supplementary Table 1.

The match rate was higher among first-time applicants compared to applicants who applied to a prior Match cycle and did not match (76.7% vs. 58.4%,  $P < 0.01$ ). The mean (SD) USMLE Step 1 and Step 2CK scores were also higher in the matched group compared to the non-matched group (237.7 (18.7) vs. 222.0 (19.7),  $P < 0.01$ ) (239.4 (15.4) vs. 224.1 (18.2),  $P < 0.01$ ). Failure in any USMLE exam was significantly associated with a lower match rate (75.7% vs. 53.7%,  $P < 0.01$ ). The total number of interviews and ranked programs was significantly higher in the matched group compared to the non-matched group (10.0 (7.2) vs. 3.0 (3.3),  $P < 0.01$ ) (9.1 (6.0) vs. 2.8 (3.0),  $P < 0.01$ ). The match rate of Syrian applicants who required visas decreased from 78.6% in the cycle before the travel ban to 64.9% in the cycles following the travel ban ( $P 0.22$ ). Similarly, the total number of interviews offered to these applicants decreased significantly following the travel ban (9.4 (7.5) vs. 6.2 (5.3),  $P 0.04$ ) [Supplementary Table 2].

**Table 1: Characteristics of Syrian applicants by Match result in all cycles**

Variable	Total % (n)	Matched % (n)	Not matched % (n)	P value
Medical school				0.15
Damascus	29.6 (66)	69.7 (46)	30.3 (20)	
Aleppo	18.4 (41)	58.5 (24)	41.5 (17)	
Other Syrian schools	13.5 (30)	83.3 (25)	16.7 (5)	
Outside Syria	38.6 (86)	72.1 (62)	27.9 (24)	
Years since graduation				0.09
Within 2 years	25.6 (57)	75.4 (43)	24.6 (14)	
3–5 years	46.6 (104)	74.0 (77)	26.0 (27)	
>5 years	27.8 (62)	59.7 (37)	40.3 (25)	
Prior Match cycle attempt				<0.01
Yes	34.5 (77)	58.4 (45)	41.6 (32)	
No	65.5 (146)	76.7 (112)	23.3 (34)	
Step 1 score—mean (SD)	233.0 (20.3)	237.7 (18.7)	222.0 (19.7)	<0.01
Step 2CK score—mean (SD)	234.9 (17.7)	239.4 (15.4)	224.1 (18.2)	<0.01
Failure in any USMLE exam				<0.01
Yes	24.2 (54)	53.7 (29)	46.3 (25)	
No	75.8 (169)	75.7 (128)	24.3 (41)	
Clinical elective experience				0.70
Yes	44.4 (99)	71.7 (71)	28.3 (28)	
No	55.6 (124)	69.4 (86)	30.7 (38)	
Clinical observership/externship experience				0.68
Yes	66.8 (135)	70.4 (95)	29.6 (40)	
No	33.2 (67)	73.1 (49)	26.9 (18)	
Visa requirement				0.93
Yes	29.2 (65)	70.7 (46)	29.3 (19)	
No	70.9 (158)	70.3 (111)	29.7 (47)	
Total interview invitations—mean (SD)	7.9 (7.0)	10.0 (7.2)	3.0 (3.3)	<0.01
Total ranked programs—mean (SD)	7.2 (6.1)	9.1 (6.0)	2.8 (3.0)	<0.01

### Factors affecting the Match outcome 2017–2019

In a multivariate logistic regression analysis [Table 2], visa requirement was an independent factor for match after adjusting for all other factors. Applicants who required a visa had a 70% lower chance of matching compared to applicants who did not require a visa (odds ratio [OR] 0.3, 95% confidence interval [CI] 0.1–0.8, *P* 0.01). The model also showed that higher USMLE Step 2CK score (OR 1.1, 95% CI 1.02–1.09, *P* < 0.01) and having at least one failed attempt in any USMLE exam (OR 0.2, 95% CI 0.1–0.6, *P* < 0.01) were also independent factors affecting the Match outcome positively and negatively, respectively.

### Factors affecting number of interviews offered to Syrian applicants 2017–2019

To evaluate the main factors that affected the number of interviews received by applicants, we conducted a multivariate linear regression model as shown in Table 3. Visa requirement was found to be a negative independent factor for receiving interviews (Coef. –3.9, standard error [SE] 1, 95% CI [–5.9, –1.9], *P* < 0.01). Having at least one failed attempt in any USMLE exam was also negatively associated with the number of interviews received (Coeff. –2.9, SE 0.9, 95% CI [–4.8, –0.9], *P* < 0.01). Other factors such as USMLE exam scores and clinical elective rotation experience were associated with a positive impact on receiving interview invitations.

**Table 2: Multivariate logistic regression for factors affecting Match result for Syrian applicants**

Variable	OR (95% CI)	P value
Medical school (Ref: Damascus)		
Aleppo	0.4 (0.1–1.2)	0.11
Other Syrian schools	1.6 (0.4–5.9)	0.49
Outside Syria	0.7 (0.2–2.1)	0.53
Years since graduation (Ref: within 2 years)		
3–5 years	2.6 (0.88–7.5)	0.08
>5 years	2.2 (0.6–7.8)	0.23
Prior Match cycle attempt (Ref: no)	0.9 (0.4–2.1)	0.88
Step 1 score	1.0 (0.9–1.1)	0.28
Step 2CK score	1.1 (1.02–1.09)	<0.01
Failure in any USMLE exam (Ref: no)	0.2 (0.1–0.6)	<0.01
Clinical elective experience (Ref: no)	1.9 (0.9–4.4)	0.11
Clinical observership/externship experience (Ref: no)	0.9 (0.4–2.0)	0.77
Visa requirement (Ref: no)	0.3 (0.1–0.8)	0.01

## DISCUSSION

In our study, we reported the match rates and characteristics of Syrian physicians applying to residency in the US. Over the last three NRMP® Match cycles, the match rate for Syrian physicians was 70.4%, which was higher than the match rate for overall non-US IMGs (55.7%) during the same period.<sup>[3]</sup> Although the match rate of non-US IMGs increased from 52.4% to 58.6% in the last three cycles, the match rate for Syrian physicians declined from 76.6% to 64.4% during

**Table 3: Multivariate linear regression for factors affecting the number of interviews received by Syrian applicants**

Variable	Coef.	SE	95% CI		P value
Medical school (Ref: Damascus)					
Aleppo	0.1	1.2	-2.3	2.4	0.95
Other Syrian schools	-2.0	1.3	-4.6	0.52	0.12
Outside Syria	-1.5	1.2	-3.8	0.9	0.22
Years since graduation (Ref: within 2 years)					
3-5 years	0.1	1.1	-2.1	2.4	0.89
>5 years	-2.9	1.4	-5.7	-0.1	0.04
Prior Match cycle attempt (Ref: no)	0.3	0.9	-1.6	2.2	0.77
Step 1 score	0.1	0.02	0.04	0.2	<0.01
Step 2CK score	0.1	0.03	0.04	0.2	<0.01
Failure in any USMLE exam (Ref: no)	-2.9	0.9	-4.8	-0.9	<0.01
Clinical elective experience (Ref: no)	2.1	0.9	0.4	3.8	0.01
Clinical observer experience (Ref: no)	0.9	0.9	-0.8	2.7	0.29
Visa requirement (Ref: no)	-3.9	1.0	-5.9	-1.9	<0.01

the same period.<sup>[3]</sup> Aside from the lower rates of clinical elective, observership, and externship experience in the 2019 cycle compared to the 2017 cycle, Syrian applicants had similar characteristics over the last three Match cycles. The difference in the US clinical experience cannot solely explain the decline in match rates among Syria applicants. However, we identified three factors that affected the Match results using a multivariate analysis model. These factors were higher USMLE Step 2CK score (positive), having at least one failed attempt in any USMLE exam (negative), and requiring a visa (negative). More specifically, requiring a visa decreased the chance of matching by 70% and failing in any USMLE exam decreased it by 80%. Furthermore, our study results identified five factors that affected the number of interview invitations received by Syrian applicants. Higher USMLE Step 1 and 2CK scores and US clinical elective experience significantly increased the number of interview invitations. On the contrary, requiring a visa and having at least one failed attempt in any USMLE exam negatively affected the number of interview invitations.

Several articles and narratives described the consequences of the travel ban on the health-care system and medical education in the US.<sup>[9-11]</sup> Nonetheless, the travel ban primarily affected physicians who were originally from the eight banned countries and seeking residency positions in the US programs. In general, the total number of nonimmigrant visas issued to Syrians between 2016 and 2018 declined by 77% and the rejection rate for tourist visas (B1) reached 77.3%.<sup>[12,13]</sup> Therefore, this rendered the Syrian physicians at a baseline disadvantage in terms of completing their USMLE exams and applying to residency positions in the US. Considering the considerable contributions of Syrian physicians to the US medical workforce, this may worsen the physicians' shortage problem facing the US.

Our study evaluated the impact of the travel ban on Syrian physicians applying to the US residency Match. Among

Syrian physicians who required visas, the match rate dropped by 13.7% and the mean number of interviews received dropped by 34% in the cycles following the implementation of the travel ban, as compared to a previous cycle. Moreover, IMGs who complete their training on a J-1 visa are required to leave the US for two years before they are able to enter the country again. However, the Conrad-30 program allows them to stay in the US and supply rural and underserved communities with 800-1000 physicians annually.<sup>[14]</sup> Such rural programs are usually avoided by US graduate physicians. The Educational Commission for Foreign Medical Graduates reported in 2015 that Syria was one of the top 10 nations of origin for J-1 physicians and 5% of J-1 visa waiver physicians enrolled in the Conrad program in the Fiscal Year 2000-2001.<sup>[2,15]</sup> Without a visa, Syrian physicians are blocked from pursuing medical training in the US, which will reflect on the physician workforce in the future.<sup>[9]</sup>

### LIMITATIONS

As with any survey study, there are inherent limitations as to what can be concluded. Risk of selection bias can arise because of the nature of self-recruitment for this study, as those that matched might be more prone to self-select themselves and fill out the survey compared to those that did not. Selection bias can also be caused by the use of social media to recruit participants, as some applicants might not be on social media or might not have been active enough to notice and see the survey invitation link. In addition, it was difficult to verify the identity of participants because we did not collect personal information. This can also explain the small sample size.

Furthermore, our data include applicants for the 2017, 2018, and 2019 cycle years, which are within the time frame of anti-immigration rhetoric that had risen a few years before that. We were, therefore, unable to compare to previous years when the immigration process was somewhat easier for

IMGs looking forward to enter the US physician workforce and train in the US. Similar to other observational studies, the nature of the data as well as the analysis methods used limit making strong conclusions, particularly of causality. The results presented here, therefore, should be considered hypothesis-generating, used only to shed light on this sensitive issue, and hopefully facilitate future larger studies on the topic.

## CONCLUSION

Syrian physicians seeking residency positions in the US have a higher match rate than other non-US IMGs. Requiring a visa and failing in any USMLE exam negatively impacted the match rate and number of interview invitations received by Syrian applicants. The significant increase in the number of visas declined to Syrian physicians affected their ability to seek and secure residency positions in the US over the past three years.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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<b>Supplementary Table 1: Characteristics of Syrian applicants by Match cycle and result</b>						
Variable	2017		2018		2019	
	Matched % (n)	Not matched % (n)	Matched % (n)	Not matched % (n)	Matched % (n)	Not matched % (n)
Total	76.6 (59)	23.4 (18)	69.9 (51)	30.1 (22)	64.4 (47)	35.6 (26)
Medical school						
Damascus	76.5 (13)	23.5 (4)	80.0 (16)	20.0 (4)	58.6 (17)	41.4 (12)
Aleppo	57.1 (8)	42.9 (6)	60.0 (9)	40.0 (6)	58.3 (7)	41.7 (5)
Other Syrian schools	81.8 (9)	18.2 (2)	90.0 (9)	10.0 (1)	77.8 (7)	22.2 (2)
Outside Syria	82.9 (29)	17.1 (6)	60.7 (17)	39.3 (11)	69.6 (16)	30.4 (7)
Years since graduation						
Within 2 years	90.9 (20)	9.1 (2)	61.1 (11)	38.9 (7)	70.6 (12)	29.4 (5)
3–5 years	75.7 (28)	24.3 (9)	78.8 (26)	21.2 (7)	67.7 (23)	32.4 (11)
>5 years	61.1 (11)	38.9 (7)	63.6 (14)	36.4 (8)	54.6 (12)	45.5 (10)
Prior Match cycle attempt						
Yes	69.6 (16)	30.4 (7)	52.0 (13)	48.0 (12)	55.2 (16)	44.8 (13)
No	79.6 (43)	20.4 (11)	79.2 (38)	20.8 (10)	70.4 (31)	29.6 (13)
Step 1 score—mean (SD)	237.1 (16.5)	225.9 (14.2)	236.4 (16.2)	224.4 (17.6)	239.8 (23.6)	217.3 (24.0)
Step 2CK score—mean (SD)	241.2 (16.8)	225.3 (18.2)	240.1 (13.6)	223.3 (15.1)	236.4 (15.4)	223.9 (21.1)
Failure in any USMLE exam						
Yes	57.9 (11)	42.1 (8)	50.0 (6)	50.0 (6)	52.2 (12)	47.8 (11)
No	82.8 (48)	17.2 (10)	73.8 (45)	26.2 (16)	70.0 (35)	30.0 (15)
Clinical elective experience						
Yes	79.2 (38)	20.8 (10)	68.0 (17)	32.0 (8)	61.5 (16)	38.5 (10)
No	72.4 (21)	27.6 (8)	70.8 (34)	29.2 (14)	66.0 (31)	34.0 (16)
Clinical observer experience						
Yes	74.6 (41)	25.4 (14)	71.7 (38)	28.3 (15)	59.3 (16)	40.7 (11)
No	81.8 (18)	18.2 (14)	65.0 (13)	35.0 (7)	72.0 (18)	28.0 (7)
Visa requirement						
Yes	78.6 (22)	21.4 (6)	61.9 (13)	38.1 (8)	68.8 (11)	31.2 (5)
No	75.5 (37)	24.5 (12)	73.1 (38)	26.9 (14)	63.2 (36)	36.8 (21)
Total interview invitations—mean (SD)	10.5 (8.2)	3.6 (3.2)	8.8 (5.4)	2.5 (3.2)	10.8 (7.5)	2.9 (3.6)
Total ranked programs—mean (SD)	9.0 (6.4)	3.3 (2.8)	8.2 (5.0)	2.3 (3.2)	10.1 (6.5)	2.8 (3.0)

<b>Supplementary Table 2: Match outcomes of Syrian applicants requiring visas</b>				
Variable	Before travel ban (2017 cycle)	Post-travel ban (2018 and 2019 cycles)	P value	
Match rate	78.6%	64.9%	0.22	
Total interview invitations—mean (SD)	9.4 (7.5)	6.2 (5.3)	0.04	