



Influence of Sociodemographic Factors on Digital Adoption among Healthcare Professionals in Morocco

Influence of Sociodemographic Factors on Digital Adoption among Moroccan Healthcare Professionals

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Abstract: Despite significant governmental efforts to promote the digitalization of Morocco's healthcare sector, challenges remain due to sociodemographic factors specific to healthcare professionals. While the global benefits of digital technology adoption are undeniable, its effective implementation requires adaptation to local contexts shaped by human factors. This study investigates whether variables such as gender, professional role, years of experience, workplace setting, and medical specialty influence the use of digital tools in healthcare. A structured questionnaire covering four key dimensions—email communication, telemedicine, social media, and professional websites—was administered to 267 healthcare professionals. Using random sampling, each member of the Rabat delegation had an equal probability of selection. Statistical analyses, including Cronbach's alpha, ANOVA, Eta-squared, Chi-square, and Cramer's V, were applied to measure the association between sociodemographic characteristics and digital tool adoption among Moroccan healthcare professionals.

Keywords: Digital health, healthcare professionals, sociodemographic factors.

Digital Object Identifier (DOI): <https://doi.org/10.5281/zenodo.17086914>

1. Introduction

The healthcare sector in Morocco has seen significant advancements in recent years, aiming to ensure quality services, equally distributed across the national territory and financially accessible. Despite the progress made, particularly in terms of reducing infant and maternal mortality, increasing life expectancy, and achieving exemplary vaccination coverage, the healthcare sector must now face new challenges. The imminent rollout of basic medical coverage and the health and societal disruptions caused by the COVID-19 pandemic have underscored the need for the healthcare sector to modernize and leverage new technologies. Digital transformation has thus become a realistic alternative for a resilient healthcare system capable of adapting to future challenges.

Recognizing the importance of digitization for the healthcare sector, the Ministry of Health and Social Protection has included digital health in its sectoral strategies since 2008. This approach aims to concretize the national health information system, digitize data flows between healthcare stakeholders, and promote new medical practices such as telemedicine nationwide. This digital transformation also aligns with Morocco's ambition to become a major player in digital technology in Africa. Through various strategies such as "e-Morocco 2010," "Digital Morocco 2013," "Digital Morocco 2020," and "Horizon 2025," the country aims to position itself as a digital destination of choice internationally. For several decades, Morocco has been committed to reforms aimed at improving the health of its population, as part of a quest for human development and social justice (Ouazanni et al., 2018). These efforts have led to the establishment of a diversified healthcare offering, covering primary healthcare, prevention programs, vaccination against epidemics, and quality hospital infrastructure, including hospital-university facilities to train qualified human resources.

In 2011, in response to growing social demand, constitutional reform enshrined access to healthcare as a full-fledged right. Since then, notable progress has been made in health policies and services. Public health indicators over the past twenty years reflect a significant improvement in life expectancy at birth, estimated at 77 years (+9 years), a three-fold reduction in the maternal death ratio, and a halving of the infant mortality rate. Despite these advancements, the Moroccan healthcare system still faces several major challenges, including an increase in chronic epidemiological burden, significant regional disparities, hospital capacity and number of healthcare professionals below international standards, and financing still largely borne by households (Haddad et al., 2019).

Since 2018, Morocco has realized that the goal of universal health coverage is perfectly achievable but requires a comprehensive and deep overhaul of the healthcare system, accompanied by an acceleration of the rollout of basic medical coverage. Today, the pillar of medical coverage for all by 2022, announced by His Majesty King Mohammed VI, offers a historic opportunity to truly upgrade the Moroccan healthcare system, promoting full synergy between the public and private sectors. To achieve this goal, the profound reform of the healthcare system will need to rely particularly on upgrading and expanding healthcare services, reducing the deficit in human resources, and enhancing the value of the public health service. It should also promote a regional approach to sector management, align public policies on disease prevention and control, and strengthen the liberal sector as a reform partner. Finally, the digital transformation of the sector will be achieved through the establishment of an integrated national health information system (SNIS).

Digital transformation represents a major opportunity for the development of e-health in Morocco. Indeed, it offers the possibility to address the country's socio-economic challenges, notably by improving the quality of public services, increasing economic productivity and competitiveness, and reducing social and spatial inequalities (Tazi et al., 2020). In this context, digitization can open up new perspectives by enabling disadvantaged populations to access information and social benefits, including healthcare services (Bouayad et al., 2019). The digitization of the healthcare sector also offers new

perspectives, thanks to the mass and volume of health data available. The development of electronic medical records to facilitate the sharing of medical information and medical monitoring will improve patient care. Telemedicine will redraw the healthcare map and rebalance the territory in favor of low-density areas.

2. Review of literature

The impact of sociodemographic factors on the use of digital tools by healthcare professionals has been the subject of several previous studies conducted in an international context. The literature analyzed in the context of this research has highlighted the influence of certain parameters such as age, gender, specialty, and experience as predominant factors in the use of digital tools. An analysis of scientific articles published between 1998 and 2009, related to barriers to the acceptance of digital use by healthcare professionals, has shown that financial, technical, psychological, social, and legal factors influence this decision (Boonstra and Broekhuis, 2010). A similar study was conducted by Li et al. (2013) regarding the analysis of parameters impacting the use of digital tools by healthcare professionals. The significant correlation was mainly found at the level of professionals' characteristics such as specialty, level of education, and experience. Grassl et al. (2018) examined the attitude of healthcare professionals in obstetrics in Germany towards telemedicine through a quantitative study based on a questionnaire administered via the internet. They found that healthcare professionals with more than 10 years of experience are not in favor of using telemedicine.

Saleh et al. (2016) explored the readiness of healthcare professionals in Lebanon to use digital tools in the context of e-health. The study is based on a questionnaire administered to physicians, nurses, and other healthcare professionals. Through ANOVA tests and Student's t-tests, the study demonstrated that specialty influences digital use. Gagnon et al. (2012) studied the impact of sociodemographic factors on the integration of digital tools within clinics. Similar to the study conducted in Lebanon, the authors proved that specialty and practice location are factors in the use of digital tools by healthcare professionals. A study conducted in Canada yielded similar results, with age, gender, and experience being significant influencers on the intention to use digital tools in the healthcare sector (Gagnon et al., 2014). Studies have also shown the correlation of age with digital use, with younger healthcare professionals being more connected than others (Hansen and Okuda, 2018; Rasche et al., 2018; Montagni et al., 2018; Wernhart et al., 2019). The trend remains the same in the United States, where specialty, age, race, and gender have shown significantly correlated results with digital use in the healthcare sector (Menachemi and Brooks, 2006; Escoffery, 2018).

Similar results can be cited in Spain, specifically in Andalusia, where the profile of healthcare professionals plays an important role in the use of digital tools (Pereyra-Rodriguez et al., 2018). Thapa et al. (2021) explored barriers to the implementation of digital tools in healthcare among professionals and students in Saudi Arabia. The results showed variance dispersion in specific categories such as age, experience, and years of study. Studies conducted in the same country have yielded similar results, with a concentration of digital use among certain healthcare specialists (El-Mahalli et al., 2012; Albarrak et al., 2019). Furthermore, other authors such as Hennemann et al. (2017) did not find a significant impact of sociodemographic factors on the intention to use digital tools in healthcare. Some studies, however, have found that healthcare staff in the United States is ready to accept the use of digital tools as it provides an advantage in communication and information sharing (Miller et al., 2016). Indeed, sociodemographic factors are not the only ones dispersing the use of digital tools among healthcare professionals; one must also consider their familiarity with this medium (De Leeuw et al., 2020). This view is shared by Fetter (2009), who considers that the implementation of digital tools in healthcare requires prior preparation and increased training for healthcare professionals.

Drawing from the considerations outlined above, we propose the following hypotheses:

Hypothesis 1: The occupational status of a healthcare professional significantly influences their adoption of digital tools.

Hypothesis 2: Healthcare professionals with more years of experience in the medical field are less inclined to adopt digital tools compared to their younger counterparts.

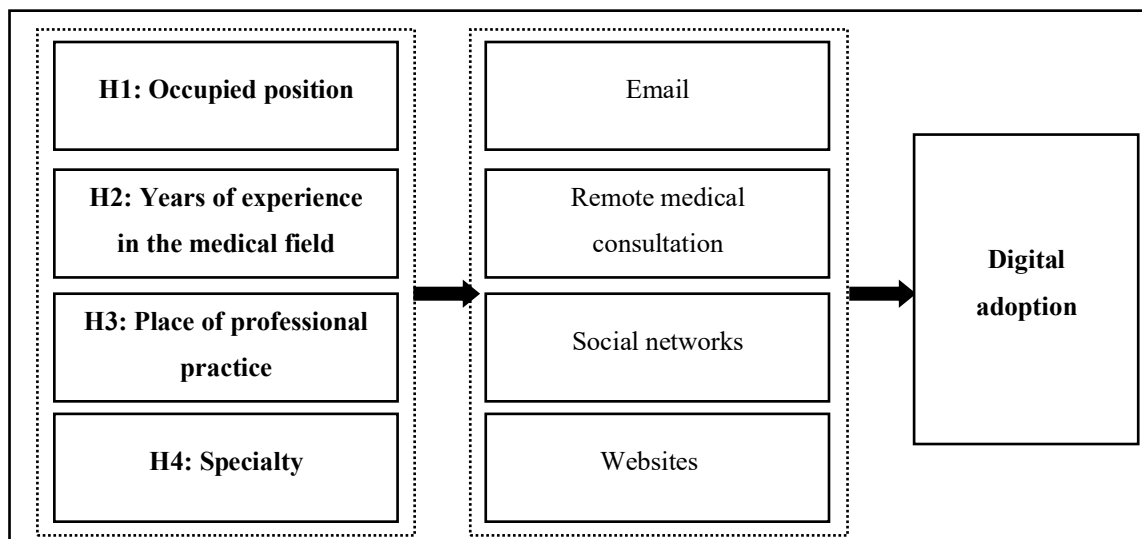
Hypothesis 3: The location where a healthcare professional practices impacts their readiness to embrace digital technologies.

Hypothesis 4: Adoption of digital tools differs among medical specialties.

3. Conceptual model

To develop a conceptual model to assess the attitude of Moroccan healthcare professionals towards the use of digital tools in their professional practice, we drew inspiration from previous studies that examined the impact of sociodemographic factors. In this regard, we identified four digital tools as dependent variables, namely email, remote consultation, social networks, and websites. In parallel, we defined four explanatory or independent variables, namely position, establishment, seniority, and specialty. The dependent variable represents the digital aspects on which we seek to evaluate the attitude of healthcare professionals, while the explanatory or independent variables are those likely to influence this attitude. These variables were selected taking into account previous studies that have demonstrated their relevance in understanding the adoption of digital tools by healthcare professionals (Thapa et al., 2021; Grassl et al., 2018). In summary, our conceptual model aims to examine how the position, establishment, seniority, and specialty of Moroccan healthcare professionals may influence their use of digital tools in their daily practice. Figure 1 graphically illustrates these relationships, highlighting the potential links between explanatory variables and the dependent variable, based on the results of previous studies.

Figure 1: Research Framework



Source: by the author

4. Research methodology

This study adopts a quantitative approach to examine how sociodemographic factors influence the adoption of digital tools by healthcare professionals in Morocco. To do so, a structured questionnaire was developed, consisting of two distinct parts. The first part of the questionnaire focuses on participants' personal data, such as gender, position held, establishment of professional practice, years of experience in the medical field, and specialty. The second part of the questionnaire is centered on

digital aspects, including email, remote medical consultations, social networks, and websites. Each digital section comprises 10 questions assessed on a Likert scale from 1 to 5, where 1 corresponds to "strongly disagree" and 5 to "strongly agree."

We conducted a survey among healthcare professionals in Morocco, including physicians, pharmacists, and dentists, working in various establishments such as diagnostic centers, health clinics, regional hospitals, local medical centers, or dental clinics within the Rabat delegation. To ensure randomness in participant selection and to provide every member of the population an equal opportunity to be included, we distributed the questionnaire through various channels, primarily using WhatsApp. The collected data were analyzed using SPSS Statistics 25 software. Initially, we calculated Cronbach's alpha to assess the reliability of the questionnaire items. Then, we used ANOVA tests, chi-square, and Cramer's V to examine the interactions between variables and draw significant conclusions.

5. RESULTS AND DISCUSSION

The descriptive data from the 267 responses to the questionnaires distributed to healthcare professionals are presented in Table 1. It is observed that out of all respondents, 80 are male (30%) while 187 are female (70%). Regarding the distribution of professions, 82 respondents are dentists (30.71%), 127 are doctors (47.57%), and 58 are pharmacists (21.72%). A significant proportion of respondents, 44.19%, practice in regional hospitals. The remaining responses are distributed as follows: Hemodialysis center (n=5, 1.87%), diagnostic center (n=8, 3.00%), health center (n=59, 22.10%), day clinic (n=37, 13.86%), and local medical center (n=24, 8.99%). Regarding professional experience, the questionnaire data indicate that 83 respondents have experience ranging from one to nine years (31.09%), 122 respondents have experience ranging from 10 to 19 years (45.69%), while 62 respondents have over 20 years of experience (23.22%). Finally, regarding specialty, 163 respondents are general practitioners (61.05%) while 104 are specialists (38.95%).

Table 1: Demographic profile of health care professionals

Variable	Indicator	Frequency	Percentage (%)
Gender	Male	80	30.0
	Female	187	70.0
Function	Dentist	82	30.71
	Doctor	127	47.57
	Pharmacist	58	21.72
Location	Hemodialysis center	5	1.87
	Diagnostic center	8	3.00
	Health center	59	22.10
	Dental center	16	5.99
	Regional hospital center	118	44.19
	Day clinic	37	13.86
Experience	Local medical center	24	8.99
	1 - 9 years	83	31.09
	10 - 19 years	122	45.69
	More than 20 years	62	23.22
Specialty	General practitioner	163	61.05
	Specialist	104	38.95

Source: by the author, using SPSS Statistics 25

The study conducted is based on a detailed questionnaire in the research methodology, and it is therefore appropriate to assess its reliability using Cronbach's alpha coefficient. This coefficient measures the internal consistency of the questionnaire on a scale from 0 to 1, where values close to 1

indicate high reliability. In our survey, the Cronbach's alpha coefficient obtained using SPSS software is 0.782, which indicates a statistically acceptable level of reliability.

Table 2: Reliability Statistics - Cronbach's Alpha

Cronbach's Alpha	Conbach's Alpha based on Standardized items	Number of items
0.782	0.730	40

Source: by the author, using SPSS Statistics 25

After assessing the questionnaire's reliability, we conducted an ANOVA test to examine differences in the adoption of digital tools among different categories of healthcare professionals. The results presented in Table 3 reveal that the use of email depends mainly on gender ($F = 19.09$, $p\text{-value} < 1\%$), professional position ($F = 16.58$, $p\text{-value} < 1\%$), place of practice ($F = 22.42$, $p\text{-value} < 1\%$), and years of experience ($F = 13.37$, $p\text{-value} < 1\%$). Regarding the adoption of remote medical consultations, no significant difference was observed between genders ($F = 2.43$, $p\text{-value} = 0.12$), indicating similar usage among men and women. However, professional position and place of practice show a significant difference for this mode of remote medical interaction ($F = 44.56$, $p\text{-value} < 1\%$; $F = 3.18$, $p\text{-value} < 1\%$). Similarly, the experience and specialty of healthcare professionals show significant disparities in the adoption of remote medical consultations ($F = 3.30$, $p\text{-value} < 5\%$; $F = 24.18$, $p\text{-value} < 1\%$).

The use of social networks also reveals disparities based on professional position and place of practice ($F = 30.98$, $p\text{-value} < 1\%$; $F = 41.06$, $p\text{-value} < 1\%$). Unlike years of experience, which do not show significant disparities among questionnaire respondents ($F = 1.14$, $p\text{-value} = 0.32$). The difference regarding the specialty variable is significant at the 5% threshold ($F = 6.06$, $p\text{-value} = 0.014$). However, the adoption of websites did not show any significant differences among the categories of respondents, as the statistics from the ANOVA test were not significant, particularly for gender ($F = 0.08$, $p\text{-value} = 0.77$), position ($F = 0.02$, $p\text{-value} = 0.98$), location ($F = 0.14$, $p\text{-value} = 0.99$), experience ($F = 0.10$, $p\text{-value} = 0.90$), and specialty ($F = 0.01$, $p\text{-value} = 0.90$).

Table 3: ANOVA test of healthcare professionals' profile impact on digital tools adoption

Variable	Gender		Function		Location		Experience		Specialty	
	Fisher's F	Sig.	Fisher's F	Sig.	Fisher's F	Sig.	Fisher's F	Sig.	Fisher's F	Sig.
Email	19,091	0,000	16,579	0,000	22,418	0,000	13,367	0,000	2,439	0,120
Remote medical visit	2,433	0,120	44,563	0,000	3,184	0,005	3,304	0,038	24,178	0,000
Social media	0,144	0,705	30,983	0,000	41,058	0,000	1,142	0,321	6,058	0,014
Websites	0,084	0,772	0,020	0,981	0,138	0,991	0,097	0,908	0,015	0,902

Source: by the author, using SPSS Statistics 25

Based on the ANOVA analysis conducted on the different respondent categories, we calculated Eta-squared to assess the magnitude of the effect associated with each independent variable on the dependent variable. For the email variable, the results in Table 4 indicate that gender has a weak effect (Eta-squared = 0.06), the healthcare professional's position has a moderate relationship (Eta-squared = 0.11), the place of practice shows a very strong effect (Eta-squared = 0.34), while years of experience

have a moderate effect (Eta-squared = 0.09), and specialty has a very weak effect on the dependent variable (Eta-squared < 0.01). Regarding remote medical consultations, gender and years of experience in the healthcare field have a weak effect on the variance of the dependent variable (Eta-squared = 0.01; Eta-squared = 0.02). In contrast, the healthcare professional's position strongly explains the variation in the adoption of remote medical consultations (Eta-squared = 0.25). The place of practice and specialty have a moderate impact on the explained variable (Eta-squared = 0.07; Eta-squared = 0.08).

For social networks, gender and years of professional practice have a very weak effect on the variation in the use of social networks in healthcare (Eta-squared = 0.001; Eta-squared = 0.009). However, the healthcare professional's position shows a significant effect size on social media usage (Eta-squared = 0.19), while the place of practice has a very strong effect size (Eta-squared = 0.49). However, websites show no significant relationship with sociodemographic factors, with calculated Eta-squared values being of low intensity (Eta-squared < 0.01). These results are consistent with the ANOVA test, which did not reveal any significant disparities regarding the use of websites by healthcare professionals.

Table 4: Eta-squared test of digital tools adoption

Variable	Gender	Function	Location	Experience	Specialty
	Eta-squared	Eta-squared	Eta-squared	Eta-squared	Eta-squared
Email	0,067	0,112	0,341	0,092	0,009
Remote medical visit	0,009	0,252	0,068	0,024	0,084
Social media	0,001	0,190	0,487	0,009	0,022
Websites	0,000	0,000	0,003	0,001	0,000

Source: by the author, using SPSS Statistics 25

Table 5 presents the associations between independent variables related to the sociodemographic factors of healthcare professionals and the use of digital tools in the healthcare field. Regarding the use of email, gender shows a significant association (Chi-square = 16.65, Cramer's V = 0.25, p-value < 1%). However, this association remains weak, with a Cramer's V between 0.1 and 0.3. These results indicate a significant disparity between men and women, with 114 women favoring the use of email compared to only 27 men. In terms of percentages, 61% of women are in favor, compared to 39% of men. In contrast, 34% of men are in favor, while 61% are against it. The profession of healthcare professionals also shows interesting results (Chi-square = 30.36, Cramer's V = 0.34, p-value < 1%), indicating a moderate association with the use of email. Physicians use email more often (66%) compared to dentists (46%) and pharmacists (26%). Furthermore, the establishment where healthcare professionals work plays an important role in the adoption of email (Chi-square = 96.49, Cramer's V = 0.6, p-value < 1%). The data shows a concentrated use of this tool in day clinics (100%) and local medical centers (100%), while 27% of professionals working in regional hospitals use it. Hemodialysis centers (20%), diagnostic centers (38%), and dental centers (88%) show a similar trend.

Professional experience is also moderately associated with the use of email (Chi-square = 26.07, Cramer's V = 0.31, p-value < 1%). Professionals with one to nine years of experience use email more often (76%) compared to those with 10 to 19 years of experience (41%) and those with over 20 years of experience (45%). These results are consistent with previous studies (Hansen and Okuda, 2018; Rasche et al., 2018; Montagni et al., 2018; Wernhart et al., 2019). However, specialty is not associated with the use of email by healthcare professionals (Chi-square = 2.34, Cramer's V = 0.09, p-value = 0.13). Regarding the variable of remote medical visits, the gender of healthcare professionals does not have a significant association (Chi-square = 2.46, Cramer's V = 0.10, p-value = 0.12), while the profession shows a strong association (Chi-square = 69.97, Cramer's V = 0.51, p-value < 1%). It is observed that

93% of pharmacists and 57% of physicians are in favor of remote medical visits, while only 22% of dentists opt for this telemedicine modality. The place of professional practice is also moderately associated with the use of telemedicine (Chi-square = 19.34, Cramer's V = 0.27, p-value < 1%). Dental centers (88%), hemodialysis centers (80%), local medical centers (71%), diagnostic centers (63%), and health centers (61%) show a preference for remote medical visits. However, regional hospitals (45%) and day clinics (41%) use it less frequently.

Seniority is weakly associated with remote medical visits (Chi-square = 7.83, Cramer's V = 0.17, p-value < 1%). Professionals with 10 to 19 years of experience are more favorable to this modality (63%) compared to those with one to nine years of experience (45%) and those with over 20 years of experience (48%). Regarding specialty, there is a moderately strong association with the adoption of remote medical visits (Chi-square = 23.10, Cramer's V = 0.29, p-value < 1%). General practitioners (66%) use this form of telemedicine more than specialists (36%). Table 5 also reveals a significant association between the use of social media in healthcare and the profession (Chi-square = 55.28, Cramer's V = 0.46, p-value < 1%), the place of practice (Chi-square = 131.04, Cramer's V = 0.7, p-value < 1%), and specialty (Chi-square = 7.65, Cramer's V = 0.17, p-value < 1%). Indeed, dentists (88%) and pharmacists (84%) use social media to collect and share information on healthcare, compared to 43% among physicians. The place of professional practice is also an important variable, as in regional hospitals (100%), dental centers (63%), and diagnostic centers (75%), professionals often use this tool, unlike hemodialysis centers (0%), health centers (46%), and day clinics (16%).



Table 5: Chi-square and Cramer's V test of digital tools use

Variable	Gender			Function			Location			Experience			Specialty		
	Chi-square	Cramer's V	p-value	Chi-square	Cramer's V	p-value	Chi-square	Cramer's V	p-value	Chi-square	Cramer's V	p-value	Chi-square	Cramer's V	p-value
Email	16,65	0,25	0,00	30,36	0,34	0,00	96,49	0,60	0,00	26,07	0,31	0,00	2,34	0,09	0,13
Remote medical visit	2,46	0,10	0,12	69,97	0,51	0,00	19,34	0,27	0,00	7,83	0,17	0,02	23,10	0,29	0,00
Social media	0,13	0,02	0,72	55,28	0,46	0,00	131,04	0,70	0,00	3,05	0,11	0,22	7,65	0,17	0,01
Websites	3,08	0,11	0,08	7,92	0,17	0,02	72,78	0,52	0,00	5,00	0,14	0,08	6,61	0,16	0,01

Source: by the author, using SPSS Statistics 25



6. CONCLUSION

The integration of digital tools in the healthcare sector has become an essential asset to ensure transparency, quality, and efficiency in healthcare services. Digital tools are diverse and varied in the healthcare field, but in the Moroccan context, we notice a trend towards the use of email services, remote medical consultations especially after the COVID-19 crisis, the use of social networks for training and communication purposes, as well as browsing websites. However, the constraint lies in the element related to human resources, as certain sociodemographic factors present barriers to the implementation of these tools. We have proven through our survey that young healthcare professionals are more inclined to use digital tools, yet this integration often depends on the establishment of professional practice as well as the position and specialty. This trend is also observed in other contexts such as the United States (Menahemi and Brooks, 2006; Escoffery, 2018), Germany (Grassl et al., 2018), and Saudi Arabia (El-Mahalli et al., 2012; Albarrak et al., 2019; Thapa et al., 2021). However, each scientific study has constraints and specificities. In our context, it is necessary to question the influence or significant association of certain variables such as competence or training, as some healthcare professionals do not trust digital tools or do not use them due to inexperience in the field of new technologies (Hennemann et al., 2017). This study also opens the door to further research by considering expanding the sample to include other healthcare professionals, different practice establishments and the incorporation of substitute variables beyond the sociodemographic elements.

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