

# Willingness and determinants of participation in public health research: a cross-sectional study in Saudi Arabia

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## Abstract

**Background:** Active participation in health research plays an integral role in the development and implementation of evidence-based health interventions and policies.

**Aims:** To assess public willingness and determinants of participation in public health research.

**Methods:** A cross-sectional survey targeting Saudi residents aged > 16 years from the 13 regions of Saudi Arabia, using computer-assisted telephone interviews. We assessed the sociodemographic of participants, participants' involvement in research, their acceptance to participate, barriers hindering their participation, and their willingness to be involved in future health research. Pearson's  $\chi^2$  and logistic regression analyses were used to explore determinants.

**Results:** There were 2512 participants in this study. Three hundred and seventy one (14.8%) confirmed that they had been invited previously to participate in research studies and 271 (73%) accepted the invitation. The majority (92%,  $n = 2319$ ) of participants were willing to participate in future research. Being a young adult, male, college-educated, and employed were the main factors associated with willingness to participate in health research. Those who had previous experience of participation in health research were 3 times more willing to participate in future health research compared with participants with no prior experience ( $P < 0.001$ ).

**Conclusions:** This study highlighted the key determinants of willingness to participate in health research. Most participants had never been invited to participate in health research, but the majority reported a positive attitude towards participation. With rapid health system development nationally and regionally, Saudi participation levels in health research still need improvement.

Keywords: community involvement; medical research; public health; research awareness; research participation

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## Introduction

Active community participation in research has a positive impact on public health. Engaging community members in the research process empowers them to improve their community health (1,2). The active participation of diverse members of society in research studies ensures that the study sample is representative and the research is relevant to the needs of its target population (3). Community participation is also important for the development and implementation of evidence-based interventions and public health policy that target the community's needs (4). Moreover, public involvement in health research affects community awareness and support for science and research (5,6).

Community participation makes a valuable contribution to health research by fostering the research process and improving the generalization and enhancing the credibility of the results. Insufficient and low recruitment rates of research participants is costly because they delay study completion and increase its expense (7,8). Low research participation can lead to ineffective translation of study findings to meet the target group's needs (3). Likewise, low enrolment in

research studies can lead to potential sampling bias and affect the validity of the study and generalization of the results (9,10). However, the public is still not fully aware of the value their participation in research has on enriching and improving health (9).

In Saudi Arabia, there are several challenges associated with conducting health research. One of these is associated with recruiting the target number of research participants. Most studies that investigate health issues in Saudi Arabia are small and target metropolitan cities, such as Riyadh, Jeddah and Dammam (11–15). In a Saudi national survey conducted through telephone interviews, female sample quotas in some regions were difficult to reach (16). Health and clinical studies face challenges in recruiting participants, which is due to research infrastructure, accessibility issues, and the limited number of research data resources (7,17,18).

Rapid development of the health sector and expansion of the population have increased the demand for health research (9,19). Increasing community participation and engagement in research is an integral part of the research process that contributes to health advances and improves quality of life (6,19). This study was conducted

to assess public willingness for and sociodemographic determinants of participation in public health research.

## Methods

### Study design

This was a self-reported cross-sectional survey conducted between July and August 2017 among Arabic-speaking Saudi residents aged > 16 years. The survey was carried out in the 13 main regions in Saudi Arabia: Riyadh, Jeddah, Abha, Hail, Tabuk, Al-Madinah, Southern Province, Aljouf, AlQassim, Najran, Jazan, Albaha, and Northern Borders. The research was reviewed and approved by the Saudi Food and Drug Authority Ethics Committee (Ethical Approval Number: 190009). Based on the nature of the research and data collected, this study was considered a minimal-to-no-risk survey and participants aged > 16 years were considered as mature minors who were able to provide informed consent to participate. Consent was obtained from all participants prior to recruitment.

### Sampling and recruitment methods

Participants were approached through a computer-aided telephone interview (CATI) after a telephone number list was generated from a governmental database. The study used a convenience sampling technique, in which the sample was randomly selected from the telephone numbers without a known probability of selection. Each participant received 3 call attempts before being dropped from the list. Participants were asked via a Web-based CATI to participate in the study voluntarily and verbal informed consent was obtained from all participants. The survey took approximately 10 minutes to complete. All questions had to be answered to be submitted to the CATI database. Therefore, there were no missing data in the dataset.

### Questionnaire design

After providing verbal consent, participants were asked about their sociodemographic characteristics, such as age, sex, region of residence, education and employment status. The questionnaire consisted of 4 main components. The first part assessed participants' involvement in research by asking them, "Have you been invited to participate in a scientific health research study in the past?" The second part assessed their acceptance to participate in research studies. The third part asked about barriers that might hinder their participation in research. The final part assessed participants' willingness to be involved in future health research.

### Data analysis

Frequencies and percentages with 95% confidence intervals (CIs) were used for descriptive analysis. Cross tabulations with Pearson's  $\chi^2$  and logistic regression analyses were used to explore determinants of participation in research. The association was considered statistically significant if P was < 0.05. SPSS version 25 was used for analysis.

## Results

A total of 2512 adults participated in this study from the 13 regions of Saudi Arabia; with a response rate of 89.71%. The median age of participants was 35 years (interquartile range 29–42 years), 1669 (66.4%) were male, and 1543 (61.4%) had a bachelor's degree (Table 1).

Only 1371 (4.8%) of the sampled population had been invited previously to participate in research studies, and 271 (73%) reported that they had agreed to participate (Table 2). Most participants (92%,  $n = 2320$ ) stated that they would be willing to participate in future health research studies. The factors that hindered community participation were low awareness of community participation in research (13%,  $n = 13$ ), time constraints (4%,  $n = 4$ ), and absence of financial incentives (4%,  $n = 4$ ). Most participants (79%,  $n = 79$ ) reported other factors

**Table 1 Sociodemographic characteristics of participants**

Sociodemographic characteristics	Mean	Standard deviation
<b>Age (years)</b>	36.34	10.24
	<b>n</b>	<b>%</b>
<b>Sex</b>		
Male	1669	66.4
Female	843	33.5
<b>Education</b>		
High school education and below	434	17.3
Diploma education	163	6.5
Bachelor education	1543	61.4
Higher education	372	14.8
<b>Employment</b>		
Employed	1834	73
Unemployed	540	21.5
Student	138	5.5
<b>Nationality</b>		
Saudi	1529	60.8
Non Saudi	983	39.1
<b>Regions</b>		
Riyadh	1352	53.8
Makkah	211	8.4
Madinah	51	2.0
Qasim	35	1.4
Eastern Province	449	17.9
Asir	116	4.6
Tabuk	119	4.7
Hail	116	4.6
Northern Borders	17	0.7
Jizan	14	0.6
Najran	19	0.8
Bahah	8	0.3
Jouf	5	0.2

**Table 2 Assessment items for public participation in health research**

Categories	Levels	n	%	95% CI
Ever received an invitation to participate in health research <sup>a</sup>	Invited	371	14.8	13.42–16.23
	Never invited	2141	85.2	83.77–86.58
Accepted the invitation to participate in research studies <sup>b</sup>	Accepted	271	73	68.18–77.44
	Refused	100	27	22.56–31.82
Factors hinder participation in health research studies <sup>c</sup>	Time constraints	4	4.0	1.29–10.51
	Lack of awareness about research	13	13	7.38–21.56
	Absence of financial incentives	4	4.0	1.29–10.51
	Others	79	79	69.47–86.25
Willingness to participate in future health research <sup>a</sup>	Willing	2319	92.3	91.19–93.32
	Not willing	193	7.7	6.68–8.81

<sup>a</sup>n = 2512; total number of participants.

<sup>b</sup>n = 371; total number of participants who received an invitation.

<sup>c</sup>n = 100; total number of participants who refused to participate.

CI = confidence interval.

as a barrier to their willingness to participate in health research.

After controlling for other sociodemographic factors (age, sex, education and employment), those with prior experience of research, who had participated at least once in any previous health research, were approximately 3 times more likely to be willing to participate in health research compared with participants with no prior experience (95% CI: 1.57–4.95,  $P < 0.001$ ). Those aged  $\geq 36$  years were less likely to have participated in health research compared with those aged  $< 36$  years (adjusted odds ratio = 0.46, 95% CI: 0.29–0.74;  $P < 0.001$ ) (Table 3). Male participants were more likely than female participants to be willing to participate in health research (adjusted odds ratio = 1.56, 95% CI: 1.12–2.18,  $P < 0.01$ ). Other determinants of willingness to participate in future research were age, education and employment ( $P < 0.001$ ,  $P = 0.04$  and  $P = 0.02$ , respectively).

## Discussion

This is one of the first studies to assess public participation in health research in the Middle East and North Africa Region. This study found that about 15% of the total participants had ever been invited to participate in previous health studies. The present level of community involvement in research needs improvement with a high demand for scientific-based health interventions and innovations in the national health system. The Saudi Vision 2030 for healthcare transformation seeks to improve public health by implementation of policies and interventions based on the recommendations of scientific research (20). This urges increased demand for community participation and involvement in health research to achieve a vibrant society and a better health system based on scientific evidence.

We showed that the majority of the study population had positive attitudes toward participation in health research, with a high rate (73%) of acceptance of participation among those who had received a previous

research invitation. These findings are similar to other research conducted in the Gulf Cooperation Council countries (9,21). A study conducted in Qatar found that most of the population had never been invited to participate in research, but they reported positive attitudes towards such participation. The favourable attitude toward participation in research will enhance national and regional scientific mobility (15,17).

Despite the challenges associated with recruitment of research participants in Saudi Arabia, most of the participants in our study had a favourable attitude toward research participation. About 92% of participants reported that they would be willing to participate in future health research, which leads us to believe that public willingness is not a limiting factor for participation. Similar findings were found in other studies conducted in Middle Eastern countries that assessed community participation in health and clinical research (9,18,21,22). Some of these studies have found that prior awareness of health research is associated with willingness to participate in future research (9,18). Similarly, this study found that previous participation in health research had a positive impact on willingness to participate in future research.

Previous studies have found that there are challenges in recruiting some groups of participants for health research (9,21). The present study showed that middle-aged and older adults, women, unemployed people, and those with below college education were less likely to be willing to participate in health research. This may lead to underrepresentation of these groups and consequently biased findings in health research (4,9). Having a representative study sample reflects the sociodemographic diversity of the target population, helps strengthen external validity, and improves implementation of health research findings (4,23). Therefore, future research may study the hesitancy, barriers and motivators for participation among these groups.

We found that more male than female participants were willing to participate in health research. Low female

**Table 3 Association of sociodemographic factors with public acceptance and willingness to participate in health research**

Factors	Levels	n	%	P value	OR	95% CI	P value	AOR	95% CI
<b>Acceptance to participate in health research</b>									
<b>Sex</b>				0.23	1.32	0.84–2.10	0.17	1.45	0.86–2.46
Male	Accepted	149	75.6						
	Refused	48	24.4						
Female	Accepted	122	70.1						
	Refused	52	29.9						
<b>Education</b>				0.42	0.81	0.49–1.35	0.4	0.79	0.46–1.36
Less than college education	Accepted	85	75.9						
	Refused	27	24.1						
College education and above	Accepted	186	71.8						
	Refused	73	28.2						
<b>Employment</b>				0.72	0.92	0.58–1.47	0.4	1.27	0.72–2.23
Unemployed	Accepted	114	74						
	Refused	40	26						
Employed	Accepted	157	72.4						
	Refused	60	27.6						
<b>Age</b>				0.002	0.48	0.30–0.76	0.001	0.46	0.29–0.74
≤ 36 years	Accepted	186	78.5						
	Refused	51	21.5						
≥ 36 years	Accepted	85	63.4						
	Refused	49	36.6						
<b>Willingness to participate in future health research</b>									
<b>Sex</b>				< 0.001	1.78	1.32–2.39	< 0.01	1.56	1.12–2.18
Male	Willing	1565	93.8						
	Not willing	104	6.2						
Female	Willing	754	89.4						
	Not willing	89	10.6						
<b>Education</b>				< 0.001	0.57	0.40–0.80	0.04	0.69	0.48–0.99
Less than college education	Willing	384	88.5						
	Not willing	50	11.5						
College education and above	Willing	1935	93.1						
	Not willing	143	6.9						
<b>Employment</b>				< 0.001	0.53	0.39–0.71	0.02	0.66	0.46–0.94
Unemployed	Willing	601	88.6						
	Not willing	77	11.4						
Employed	Willing	1718	93.7						
	Not willing	116	6.3						
<b>Age</b>				< 0.001	1.77	1.31–2.38	< 0.001	1.96	1.44–2.66
≤ 36 years	Willing	1318	94.1						
	Not willing	82	5.9						
≥ 36 years	Willing	1001	90.1						
	Not willing	111	9.9						

AOR = adjusted odds ratio; CI = confidence interval; OR = odds ratio.

participation is a global challenge that has an impact on health research (24,25). Male participants represented > 60% of the sample size in several studies conducted to assess different health risk factors in Saudi Arabia (26–28). Under-representation of women in health research can lead to undesirable and biased outcomes for the female community in the studied population (25). Therefore, increasing female involvement and participation in health research needs to be further investigated.

There are different factors that hinder public participation in health-related research. Offering incentives to participants has commonly been used to increase research participation (29,30). However, in our study, only 4% reported that the absences of incentives hindered their participation. A study conducted in Qatar and another in Kuwait found that the most frequently reported barrier to participating in research is time constraints (9,21). In the present study, a lack of awareness about research was the most commonly reported barrier. However, we found that factors other than time constraints, awareness about research, and financial incentives affected research participation. Most participants reported other hindrances to their participation in health research, which needs to be investigated further. It has been reported previously that privacy issues, fear of the study, and participants' confidence in data collectors have impacts on willingness to participate in research (4,7,31,32). From the review of literature, participation in research can be increased if participants are contacted by a well-known and highly reputable institution, or if the study is funded by government or charities (4,31,32). More research is needed to assess and tackle these issues to improve public participation in health research.

Given the cross-sectional nature of this study, there was no substantial evidence to claim a temporal relationship among factors. Another limitation of this study was that the sample did not reflect the entire Saudi population; therefore, these findings cannot be generalized to the

whole community. The study design and sampling method of this study might have resulted in selection bias and favoured data collection from people who had a positive attitude toward participation in research. However, given the high response rate of almost 90%, this study provides a snapshot of the public's willingness to participate in health research in Saudi Arabia. It also highlighted the key sociodemographic determinants of participation in health research. Future nationally representative studies with deeper insights into the barriers and motivators for participation are needed to understand better the predictors and determinants of participation in health research. Future research may also consider collecting data from nonrespondents to discover to what extent they are different from the study sample.

## Conclusions

Public participation is an integral part of the research process that contributes to health advances. Our findings have implications at the practice level to improve participation in health research. Although reduced participation rates present challenges in conducting research, we found that participation in health research was viewed favourably by most participants. The results also highlighted the sociodemographic determinants of public participation in health research. Individuals with previous participation in health research have more favourable attitudes toward participation in future health research. With a lack of data on population health nationally and regionally, this study focused on assessing participation at the data collection level. Prospective studies and interventions are recommended to improve community participation from passive to active full engagement in research. This will ensure participants' engagement not only as data points but also to empower them to be stakeholders in planning, designing and conducting research studies.

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**Competing interests:** None declared.



## Étude transversale en Arabie saoudite sur la volonté et les déterminants relatifs à la participation à la recherche en santé publique

### Résumé

**Contexte :** La participation active à la recherche en santé joue un rôle essentiel dans l'élaboration et la mise en œuvre d'interventions et de politiques sanitaires reposant sur des bases factuelles.

**Objectifs :** Évaluer la volonté du public et les déterminants de sa participation à la recherche en santé publique.

**Méthodes :** Une enquête transversale ciblant des résidents saoudiens âgés de plus de 16 ans dans les 13 régions d'Arabie saoudite, a été menée au moyen d'entretiens téléphoniques assistés par ordinateur. Nous avons évalué le profil sociodémographique des participants, leur implication dans la recherche, leur acceptation d'y participer, les obstacles qui les empêchent de le faire et leur volonté de participer à une future recherche en santé. Les analyses de régression logistique et du coefficient de corrélation de Pearson ont été utilisées pour explorer les déterminants.

**Résultats :** 2 512 personnes ont participé à cette étude. Trois cent soixante et onze personnes (14,8 %) ont confirmé avoir été préalablement invités à participer à des études de recherche et 271 (73 %) ont accepté l'invitation. La majorité des participants (92 %,  $n = 2319$ ) étaient prêts à contribuer à des recherches futures. Le fait d'être un jeune homme adulte, d'avoir reçu une éducation universitaire et d'avoir un emploi constituaient les principaux facteurs associés à la volonté de participer à la recherche en santé. Ceux qui avaient déjà participé à des recherches en santé étaient trois fois plus enclins à s'engager dans de futures recherches que ceux qui n'avaient aucune expérience antérieure ( $p < 0,001$ ).

**Conclusions :** La présente étude a mis en évidence les principaux déterminants de la volonté de participer à la recherche en santé. La plupart des participants n'avaient jamais été invités à prendre part à la recherche en santé, mais la majorité d'entre eux ont fait état d'une attitude positive envers ce type de participation. Avec le développement rapide des systèmes de santé aux plans national et régional, les niveaux de participation saoudiens à la recherche en santé doivent encore être améliorés.

### الاستعداد للمشاركة في بحوث الصحة العامة ومحدداتها: دراسة مقطعية في المملكة العربية السعودية

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#### الخلاصة

الخلفية: تؤدي المشاركة النشطة في البحوث الصحية دوراً أساسياً في إعداد وتنفيذ التدخلات والسياسات الصحية المسندة بالدلائل.

الأهداف: هدفت هذه الدراسة إلى تقييم مدى استعداد الجمهور للمشاركة في بحوث الصحة العامة ومحدداتها.

طرق البحث: أجرينا مسحاً مقطوعياً استهدف السكان السعوديين الذين تزيد أعمارهم على 16 عاماً في 13 منطقة بالمملكة العربية السعودية، باستخدام مقابلات هاتفية بمساعدة الحاسوب. قمنا بتقييم الحالة الاجتماعية والسكانية للمشاركين، ومشاركة المشاركين في البحوث، وقبولهم بالمشاركة، والعقبات التي تعوق مشاركتهم، واستعدادهم للمشاركة في البحوث الصحية المستقبلية. واستخدمت تحليلات بيرسون  $X^2$  والتحوُّف اللوجستي لاستكشاف المحددات.

النتائج: شارك في هذه الدراسة 2512 مشاركاً. وأكد 371 شخصاً (14.8%) أنهم تلقوا دعوة من قبل للمشاركة في الدراسات البحثية، وقبل 271 شخصاً (73%) الدعوة. وكان معظم المشاركين (92%)، العدد = 2319 على استعداد للمشاركة في بحوث مستقبلية. وتمثلت العوامل الرئيسية المرتبطة بالاستعداد للمشاركة في البحوث الصحية في كون المشاركين من الشباب، والذكور، والحاصلين على تعليم جامعي، والموظفين. وكان أصحاب الخبرة السابقة في المشاركة في البحوث الصحية أكثر استعداداً بثلاث مرات للمشاركة في بحوث صحية مستقبلية من المشاركين الذين ليست لديهم خبرة سابقة ( $P < 0.001$ ).

الاستنتاجات: سلطت هذه الدراسة الضوء على المحددات الرئيسية للاستعداد للمشاركة في البحوث الصحية. ومعظم المشاركين لم تُوجَّه لهم الدعوة من قبل للمشاركة في البحوث الصحية، ومع ذلك، فقد أبدى أغلبهم موقفاً إيجابياً إزاء المشاركة. ومع التطور السريع للنظم الصحية على الصعيدين الوطني والإقليمي، فلا تزال مستويات المشاركة السعودية في البحوث الصحية بحاجة إلى التحسين.

## References

1. Community engagement for quality, integrated people-centered and resilient health services [website]. Geneva: World Health Organization; 2017 (<https://www.who.int/servicedeliverysafety/areas/qhc/community-engagement/en/>, accessed 6 June 2020).
2. Keusch G, McAdam K, Cuff P, Mancher M, Busta ER, editors. Integrating clinical research into epidemic response: the Ebola experience. Washington, DC: National Academies Press; 2017 (<https://www.nap.edu/catalog/24739>, accessed 6 June 2020).
3. Bonevski B, Randell M, Paul C, Chapman K, Twyman L, Bryant J, et al. Reaching the hard-to-reach: a systematic review of strategies for improving health and medical research with socially disadvantaged groups. *BMC Med Res Methodol*. 2014 Mar 25;14:42. <http://dx.doi.org/10.1186/1471-2288-14-42> PMID:24669751
4. Statement on consumer and community involvement in health and medical research. National Health and Medical Research Center, Consumers Health Forum of Australia; 2016 (<https://www.nhmrc.gov.au/about-us/publications/statement-consumer-and-community-involvement-health-and-medical-research>, accessed 6 June 2020).
5. Thompson J, Barber R, Ward PR, Boote JD, Cooper CL, Armitage CJ, et al. Health researchers' attitudes towards public involvement in health research. *Health Expect*. 2009 Jun;12(2):209–20. <http://dx.doi.org/10.1111/j.1369-7625.2009.00532.x> PMID:19392833
6. Horowitz CR, Robinson M, Seifer S. Community-based participatory research from the margin to the mainstream: are researchers prepared? *Circulation*. 2009 May 19;119(19):2633–42. <http://dx.doi.org/10.1161/CIRCULATIONAHA.107729863> PMID:19451365
7. Newington L, Metcalfe A. Factors influencing recruitment to research: qualitative study of the experiences and perceptions of research teams. *BMC Med Res Methodol*. 2014 Jan 23;14:10. <http://dx.doi.org/10.1186/1471-2288-14-10> PMID:24456229
8. McCullagh MC, Sanon M-A, Cohen MA. Strategies to enhance participant recruitment and retention in research involving a community-based population. *Appl Nurs Res*. 2014 Nov;27(4):249–53. <http://dx.doi.org/10.1016/j.conctc.2017.10.010>. PMID:24667018
9. Tohid H, Choudhury SM, Agouba S, Aden A, Ahmed LHM, Omar O, et al. Perceptions and attitudes to clinical research participation in Qatar. *Contemp Clin Trials Commun*. 2017 Nov 1;8:241–7. <http://dx.doi.org/10.1016/j.conctc.2017.10.010> PMID:29696215
10. Kukull WA, Ganguli M. Generalizability: the trees, the forest, and the low-hanging fruit. *Neurology*. 2012 Jun 5;78(23):1886–91. <http://dx.doi.org/10.1212/WNL.0b013e318258f812> PMID:22665145
11. Jarallah JS, al-Rubeaan KA, al-Nuaim AR, al-Ruhaily AA, Kalantan KA. Prevalence and determinants of smoking in three regions of Saudi Arabia. *Tob Control*. 1999;8(1):53–6. <http://dx.doi.org/10.1136/tc.8.1.53> PMID:10465816
12. Alshaikh MK, Filippidis FT, Baldove JP, Majeed A, Rawaf S. Women in Saudi Arabia and the prevalence of cardiovascular risk factors: a systematic review. *J Environ Public Health*. 2016;2016:7479357. <http://dx.doi.org/10.1155/2016/7479357> PMID:27777590
13. Habib SS. Body mass index and body fat percentage in assessment of obesity prevalence in Saudi adults. *Biomed Environ Sci*. 2013 Feb;26(2):94–9. <http://dx.doi.org/10.3967/0895-3988.2013.02.003> PMID:23336132
14. Koura MR, Al-Dabal BK, Rasheed P, Al-Sowielem LS, Makki SM. Prehypertension among young adult females in Dammam, Saudi Arabia. *East Mediterr Health J*. 2012 Jul;18(7):728–34. <http://dx.doi.org/10.26719/2012.18.728> PMID:22891521
15. Moustafa K. Promoting an academic culture in the Arab world. *Avicenna J Med*. 2018;8(3):120–3. [http://dx.doi.org/10.4103/ajm.AJM\\_166\\_17](http://dx.doi.org/10.4103/ajm.AJM_166_17) PMID:30090754
16. Algabbani, AM, Althumiri, NA, Almarshad, AM, Bindhim, NF. National prevalence, perceptions, and determinants of tobacco consumption in Saudi Arabia. *Food Drug Regul Sci J*. 2019 Nov 12;2(2):1. <https://www.researchgate.net/publication/337066883>
17. El-Azami-El-Idrissi M, Lakhdar-Idrissi M, Ouldin K, Bono W, Amarti-Riffi A, Hida M, et al. Improving medical research in the Arab world. *Lancet*. 2013;382(9910):2066–7. [https://doi.org/10.1016/S0140-6736\(13\)62692-6](https://doi.org/10.1016/S0140-6736(13)62692-6)
18. Bazarbashi S, Hassan A, Eldin AM, Soudy H, Hussain F. Awareness and perceptions of clinical trials in cancer patients and their families in Saudi Arabia. *J Cancer Educ*. 2015 Dec 10;30(4):655–9. <https://doi.org/10.1007/s13187-015-0797-0>
19. Saudi Vision 2030. Quality Of Life Program [website]. 2017 (<https://vision2030.gov.sa/en/qol>, accessed 6 June 2020).
20. Saudi Vision 2030. National Transformation Program. Delivery plan 2018–2020. 2018 ([https://vision2030.gov.sa/sites/default/files/attachments/NTP English Public Document\\_2810.pdf](https://vision2030.gov.sa/sites/default/files/attachments/NTP%20English%20Public%20Document_2810.pdf), accessed 6 June 2020).
21. Tariq S, Goddard CA, Elkum N. Barriers in participant recruitment of diverse ethnicities in the state of Kuwait. *Int J Equity Health*. 2013 Nov 20;12(1):93. <https://doi.org/10.1186/1475-9276-12-93>
22. Bouida W, Grissa MH, Zorgati A, Beltaief K, Boubaker H, Sriha A, et al. Willingness to participate in health research: Tunisian survey. *BMC Med Ethics*. 2016 Dec 4;17(1):47. <https://doi.org/10.1186/s12910-016-0131-3>
23. Steckler A, McLeroy KR. The importance of external validity. *Am J Public Health*. 2008 Jan;98(1):9–10. 10.2105/AJPH.2007.126847 PMID:18048772
24. Morganson VJ, Jones MP, Major DA. Understanding women's underrepresentation in science, technology, engineering, and mathematics: the role of social coping. *Career Dev Q*. 2010 Dec 1;59(2):169–79. <https://doi.org/10.1002/j.2161-0045.2010.tb00060.x>
25. Health consequences of exclusion or underrepresentation of women in clinical studies (I). In: Mastroianni AC, Faden R, Federman D, editors. Women and health research ethical and legal issues of including women in clinical studies. Volume 2. Workshop and commissioned papers National Academies Press; 1999 (<https://www.ncbi.nlm.nih.gov/books/NBK236583/>).

26. Ahmed AM, Hersi A, Mashhoud W, Arafah MR, Abreu PC, Al Rowaily MA, et al. Cardiovascular risk factors burden in Saudi Arabia: the Africa Middle East Cardiovascular Epidemiological (ACE) study. *J Saudi Hear Assoc.* 2017 Oct 1;29(4):235–43. <https://doi.org/10.1016/j.jsha.2017.03.004>
27. Abdulghani HM, AlKanhal AA, Mahmoud ES, Ponnampereuma GG, Alfaris EA. Stress and its effects on medical students: a cross-sectional study at a college of medicine in Saudi Arabia. *J Health Popul Nutr.* 2011 Oct;29(5):516–22. <http://dx.doi.org/10.3329/jhpn.v29i5.8906> PMID:22106758
28. Mahfouz AA, Shatoor AS, Khan MY, Daffalla AA, Mostafa OA, Hassanein MA. Nutrition, physical activity, and gender risks for adolescent obesity in Southwestern Saudi Arabia. *Saudi J Gastroenterol.* 2011 Sep–Oct;17(5):318–22. <http://dx.doi.org/10.4103/1319-3767.84486> PMID:21912058
29. Singer E, Ye C. The use and effects of incentives in surveys. *Ann Am Acad Pol Soc Sci.* 2013 Jan 26;645(1):112–41. <https://doi.org/10.1177/0002716212458082>
30. Singer E, Couper MP. Do incentives exert undue influence on survey participation? Experimental evidence. *J Empir Res Hum Res Ethics.* 2008 Sep;3(3):49–56. <http://dx.doi.org/10.1525/jer.2008.3.3.49> PMID:19385770
31. Teschke K, Marino S, Chu R, Tsui JKC, Harris MA, Marion SA. Public opinions about participating in health research. *Can J Public Health* 2010;101(2):159–64.
32. Glass D, Kelsall H, Slegers C, Forbes A, Loff B, Zion D, et al. A telephone survey of factors affecting willingness to participate in health research surveys. *BMC Public Health.* 2015 Dec 5;15(1):1017. <https://doi.org/10.1186/s12889-015-2350-9>