Comparative Analysis of Labor Force Participation Rates in SAARC Countries Using Gray Relational Analysis

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ABSTRACT

The objectives of this research is to investigate the various issues that affect the rate of labor force participation in the SAARC countries such as Pakistan, Bangladesh, Afghanistan, India, Bhutan, Nepal, Maldives and Sri Lanka. The research investigates the effects of education levels, economic practices, cultural values and gender inequalities. The general structure of the research will be the review of the literature, extraction of secondary data and quantitative analysis. Through the use of Gray Relational Analysis, the study ranks these countries according to their labor force participation rates and this gives a comparative analysis of the countries in the region and their differences and similarities. The analysis has revealed that the Maldives is at the first position and Nepal is at the Eighth position. It is believed that the findings will provide useful information to policymakers to develop effective economic policies and achieve gender equality in the labor market. The study is a contribution to the further insight into the dynamics of labor force participation in South Asia and the key factors that can be used to stimulate the positive changes in labor market participation. It might only assess the SAARC countries based on the few criteria that were chosen, future research can be based on a greater number of countries with numerous different criteria.

Keywords: Labor Force Participation, SAARC, Gender Inequality, Gray Relational Analysis, Economic Development

INTRODUCTION

Labor force participation rate refers to an economic indicator that indicates the percentage of population which is in the employment or seeking employment. The studies of LFPR are instrumental as they provide useful data concerning the employment rate, economic development, and the social pattern in a country (Langoday & Man, 2024). The labor force participation rate (LFPR) is an extremely significant index on which researchers and policymakers have focused their attention because of its economic development and societal welfare implications. Various aspects have been cited to affect LFPR such as demographic changes, education, and policy interventions (Cholifah & Sutrisno, 2024). Studies about LFPR usually reveal complex links between economic factors and labor participation. As an example, the increase in population and the level of education has been proved to affect poverty which in its turn, promotes the participation in

the labor force (Langoday & Man, 2024). The LFPR can be influenced by cyclical factors like economic recessions as the participation rates fell during the Great Recession and the economic situation caused by negative relations on the labor market (Hotchkiss and Rios -Avila, 2013). There are also gender forces, and research has shown different impacts of economic growth on the participation of males and females in the labor force (Zou, 2022). In addition, the participation rates can be modified by demographic shifts and cultural perceptions, including the influence of epidemics on the uncertainty avoidance (Yu et al., 2020).

Even though some previous researches have brought us useful information about what aspects determine the degree of the labor force participation (LFPRs), it is also clear that there is a need to do more profound research on interaction between education and economic policies, gender inequalities, and other socio-economic aspects to obtain clear picture. The goal of such research is to unravel the ambiguities of these relations that are often context dependent and dependent on a great number of variables ((Afzali & Rostovskaya, 2022, Apire et al., 2023). These gaps in the literature should be addressed to develop effective policies which can improve the participation of the labor force and gender equity in the labor market.

Siddik (2023) made the assertion that touches of the labor force and observed a negative relationship with the economic growth, which potentially may require additional research on the trend of participation in the labor force, many research does not explicitly address such issues. Although Nayak et al. (2022) addresses the role of informal providers in primary health care, which may be connected with the issue of labor force, it does not directly appeal to the issue of labor force participation or regional differences. The lack of direct evidence in the given papers provides the idea that there is actually a knowledge gap in the literature on the particular study of labor force participation patterns and the role of regional disparities in the setting of the SAARC. This observation follows the query on lack of the research focus on these issues. This means that future research should consider these areas in a more detailed manner. Research in this area may be fruitful to explore these dimensions in order to offer a better insight into the dynamics of labor and economic differences between regions of the countries of the SAARC.

LITERATURE

The labor force participation is affected by the numerous demographics, socioeconomic and cultural variables, demonstrating the complex set of factors, which influence the choice of people to participate in the labor force. The large scale study presented in the literature reviewed provides an in depth and comprehensive discussion of these multifaceted effects in different contexts of society and national borders. Based on the synthesis of findings, it is apparent that education and training are the consistent and dominant determinants that have a positive relationship with the rise in the rate of labor force participation. The empiric data reinforce the critical importance of the higher educational attainment levels in developing a more active individuals to engage in the labor market (Rehman et al., 2023).

The rates of women and men participation in the labor market are found to have visible differences across the whole world, an aspect that is affected by several factors that affect the dynamics of the society. It is noted that male participation in the labor market has a tendency of showing a trend of high and steady rates in different geographical regions. Conversely, the number of women engaged in the labor force indicates a high level of variability, which promotes a high level of variance with the most common tendencies to be significantly lower (Azam et al., 2020; Cerda and others, 2023).

The labor force distribution of the large urban centers of Pakistan is varied according to the educational achievements and migration. Karachi, Islamabad, and Lahore have a large population of experienced migrants, whereas in other cities, there is a large number of unskilled migrant workers (Naz et al., 2022). Remittances in the Pakistani setting have an influence on decisions of labor force which results in a greater likelihood of disengagement as the amount of remitted grows. The shift in preference towards seeking self-employment opportunities and acquiring employer roles is accompanied by this phenomenon, which

implies that the policy interventions should be focused on job creation and development of entrepreneurship (Shair et al., 2021).

The engagement of the labor force in Bangladesh has experienced some significant changes over the years. Other determinants of the participation include rural residence, educational levels, and dependencies (Khan, 2023). Women involvement in the labor force has also increased tremendously, but worries still persist on the quality of labor especially when it comes to household labor, which is very much common in Bangladesh (Bidisha and Raihan, 2018).

The Female Labor Force Participation in Afghanistan is not without its problems despite its troubles in socio-cultural norms, education inequity, and job opportunities. This is even though there is a substantial economic development and enhanced female education levels (Parlaktuna & Sidiqi, 2020).

In analyzing the urban regions in India, the fact that women with low levels of education are in the labor force is more an issue of necessity and thus it is important that economic conditions have been seen to be the main driving force behind the decisions they make. On the other hand, in higher education, women are frequently tempted to enter the labor market owing to the number of economic possibilities they could have, which highlights the relevance of several factors that make women be involved in the process of working (Klasen & Pieters, 2012). The study in rural India has shown a distinct difference in augmenting family income security and transforming casual to standard wage jobs, consequently the shift in the use of women in the workforce has reduced significantly (Andres et al., 2017).

In Bhutan, the participation rate of labor force is dependent on a number of determinants including education, gender, socio-economic status, and the kind of school children attended. Studies have revealed that some of the challenges facing the country include high unemployment rates among young people due to some factors over education (Lham et al., 2019). The Bhutan labor market is mainly dominated by the government sector that is challenged by limited growth of the privatized sector and increasing reliance on remittances. The trends in the labor force participation rate in Bhutan have shown positive trends over the last decade. Bhutan has already achieved significant progress in terms of increasing the use of female labor force, despite the continuing challenges of employment quality (Adhikari, 2023).

The effects of the Industrial Revolution on workforce influence the labor market in Nepal and show the significance of the technological education and the government support in developing the future workforce (Kapri, 2022). Nepal has one of the most prominent places among the trade unions in labor relations, relating to political organizations and influencing the bargaining and resolution processes of individual conflicts (Tulachan, 2020).

The labor force participation inequality is apparent in Sri Lanka with women showing low rates when compared with men. The differences in gender in relation to participation in the labor market continue to attract disparities, where the women participation is far much less than that of men to influence the growth and equity objectives of the country. (Samarakoon & Mayadunne, 2018). Sri Lanka has a segmented labor market, which includes the following groups: public, formal private, informal private, self-employed, and agriculture, in which education plays a significant role in determining the choice of the sector (Newhouse and Silwal, 2018).

Labor relations in the Maldives represent a complex situation. Even with the availability of full employment and a relatively high wage structure, it has a high reliance on foreign labor especially in the sectors like tourism and services. The levels of labor force participation have a number of implications on the economic expansion in the Maldives. Research indicates that progress of the economy adversely affects the unemployment rate during a long period of time, and population expansion and external financial obligations contribute to the problem (Irushad et al., 2023). The Maldives has a significant gender distribution that influences the engagement of people in the labor force. Although women in the Maldives

do not experience much discrimination in basic spheres of life, they are still underrepresented in the labor market, namely in the sectors like tourism and resort industry (Faizal, 2020).

METHODOLOGY

This study follows a deductive methodology, which is a part of a positivist philosophy. The World Development Indicators (WDI) is use to obtains secondary data of the 8 different SAARC Countries. This data was collected based on a cross-sectional approach because the method was cross-sectional, and consequently it provided a full picture of the dynamics of the labor force in the SAARC countries. Using Excel calculation, this methodology made it easier to look at the main variables of the rate of participation in labor force, and other relevant indicators in the region. The sampling design used was non-probability since the data in the SAARC region was only available to a limited degree. The selection criteria were availability of data, and applicability to labor force dynamics as well as representativeness of the workforce in each individual country in order to have a balanced and insightful analysis in the region. Multi-Criteria Decision-Making Techniques (MCDMT) are often used by the authors in modern researches to evaluate and compare indicators among countries or regions. The methods that are selected are the Analytical Hierarchy Process or Preference Ranking Organization Method, depending on the nature of the phenomena under study. Since the purpose of the study is to compare labor force rates among the countries based on a set of variables, the Gray Relational Analysis (GRA) as another form of MCDMT was considered the appropriate way to perform analysis in this study.

The grey relational-theory was developed in 1989 by Dr. Deng and it transformed the research through its various analytical methods. Grey analysis entails considering several variables to obtain the most preferred alternatives in Multi-Criteria Decision Making (MCDM). Initially created in the field of scientific research, this method has now become an interdisciplinary approach that provides a connection between management and natural sciences. It works in two system basis, the white system where information is at hand and the black system where there is no information. Grey system methods include grey decisions, prediction, controlling, programming and the well known method of the grey relational analysis (GRA) which is used in discrete data sets. GRA uses mathematical equations in multi-attribute decision making which provides the accuracy and reliability in management sciences.

GRA is a step-by-step process that aims at ranking alternatives by arranging the variables in a decision matrix, creating a reference series, normalization of data, computing grey relational coefficients, and determining grey relational grades. The technique has become useful in other research where it has served as a strong complement to other more conventional statistical procedures such as correlation or regression, particularly in situations with very small amounts of data or in situations with complex decisions.

ANALYSIS AND RESULTS

To examine the labor force participation in the SAARC countries the following indicators were analyzed provided by World Development Indicators (WDI, ILO modeled estimates, 2022).

1. LFPR, Ages 15-24 (Female %)

Refers to the percentage of young females (15-24 years) who are in employment or seeking employment. It shows the degree of the youth female participation in the labor market.

2. LFPR, Ages 15-24 (Male %)

The proportion of young men in the labor force that are engaged in economic activities by working or seeking employment is a measure of male youth involvement in the economy.

3. LFPR, Female (15+ Years)

It is the proportion of women aged 15 years and over years who are engaged in the workforce, which represents the general female economy.

4. LFPR, Male (15+ Years)

Refers to the percentage of men aged 15 years or older that are occupied, or are in need of occupation, and thus give an indication of the general participation rates of males.

5. LFPR, Female (15-64 Years)

Counts the percentage of women in their potential working years (15-64) working or trying to work, and brings out gendered patterns of work.

6. LFPR, Male (15-64 Years)

Targets men within the middle working age group and is a gauge of their interest and economic participation and employment prospects.

7. Total Labor Force

Incorporates all persons, both male and female, who are employed or looking to be employed in any particular SAARC countries.

All data refer to (ILO-modeled estimates, World Bank WDI.

Applying gray relational analysis:

Step 1: Prepare a table of data for perform further calculation of Grey Relational Analysis that we extract from World Development Indicator.

Countries	Labor force participation rate for ages 15-24, female (%) (modeled ILO estimate)	Labor force participation rate for ages 15-24, male (%) (modeled ILO estimate)	Labor force participation rate, female (% offemale population ages 15-64) (modeled ILO estimate)	Labor force participation rate, male (% ofmale population ages 15-64) (modeled ILO estimate)	Labor force participation rate, female (% of female population ages15+) (modeled ILO estimate)	Labor force participation rate, male (% ofmale population ages15+) (modeled ILO estimate)	Labor force, total
Pakistan	21.926	63.494	25.885	83.876	24.401	81.004	78863081
Afghanistan	5.994	61.532	5.342	71.27	5.153	70.153	8803873
Bangladesh	25.513	52.217	39.544	82.887	37.045	80.321	73862460
India	13.258	43.077	29.924	79.037	27.985	75.399	554145127
Nepal	21.133	37.98	30.33	56.716	28.373	53.768	8740707
Bhutan	27.965	25.235	67.809	76.099	64.93	74.273	425882
Maldives	38.897	54.395	44.001	81.633	41.992	78.514	260823
Sri Lanka	21.191	40.41	36.242	77.159	32.051	72.603	8774915

Step 2: Creation of reference series and comparison sequence with the following formula to identify thebest alternative for the normalization process and to make a comparison

$x_0 = [x_0(k),\ldots\ldots\ldots x_0(n)]$ where k =1,2,n

Table 2: Calculating Maximum and Minimum

Countries	Labor force participation rate for ages 15-24, female (%) (modeled ILO estimate)	Labor force participation rate for ages 15-24, male (%) (modeled ILO estimate)	Labor force participation rate, female (% of female population ages15-64) (modeled ILO estimate)	Labor force participation rate, male (% of male population ages15-64) (modeled ILO estimate)	Labor force participation rate, female (% of female population ages15+) (modeled ILO estimate)	Labor force participation rate, male (% of male population ages15+) (modeled ILO estimate)	Labor force total
Pakistan	21.926	63.494	25.885	83.876	24.401	81.004	78863081
Afghanistan	5.994	61.532	5.342	71.27	5.153	70.153	8803873
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Bhutan	27.965	25.235	67.809	76.099	64.93	74.273	425882
Maldives	38.897	54.395	44.001	81.633	41.992	78.514	260823
Sri Lanka	21.191	40.41	36.242	77.159	32.051	72.603	8774915
Min	5.994	25.235	5.342	56.716	5.153	53.768	260823
Max	38.897	63.494	67.809	83.876	64.93	81.004	554145127

There is no set standard for creating reference sequence values. In table 2 we used original values to calculate the reference sequence. All indicators are referred on the basis of "Larger the Better" value and the reference series is consisting of the maximum value of the column. To compare Countries, we need to convert data set into normalize values ranging from 0 to 1. The normalization process is performed in Table 3.

Step 3: Create a normalize matrix. Data with bigger value effect positively and applying larger the better criteria:

$$\text{Larger the better } (k) = \frac{x_i(k) - \min x_i(k)}{\max x_i(k) - \min x_i(k)}$$

$$\text{Smaller the better } (k) = \frac{\max x_i(k) - x_i(k)}{\max x_i(y) - \min x_i(y)}$$

$$\text{Ideal the better } (k) = \frac{x_i(k) - x_i\, b(k)}{\max x_i(y) - x_i\, b(k)}$$

To create a normalized matrix, for criteria where larger values are better, the values are scaled relative to the range between the minimum and maximum values. For criteria where smaller values are better, the values are inverted and scaled similarly. For criteria where ideal values are preferred, the values are adjusted based on the ideal value and scaled accordingly.

Table 3: Normalized Values

Countries	Labor force participation rate for ages 15-24, female (%) (modeled ILO estimate)	Labor force participation rate for ages 15-24, male (%) (modeled ILO estimate)	Labor force participation rate, female (% of female population ages 15-64) (modeled ILO estimate)	Labor force participation rate, male (% of male population ages 15-64) (modeled ILO estimate)	Labor force participation rate, female (% of female population ages 15+) (modeled ILO estimate)	Laborforce participation rate, male (% of male population ages 15+) (modeled ILO estimate)	Labor force, total
Pakistan	0.484211166	1	0.328861639	1	0.321996755	1	0.141910968
Afghanistan	0	0.948717949	0	0.535861561	0	0.601593479	0.015423889
Bangladesh	0.593228581	0.705245825	0.547521091	0.963586156	0.533516235	0.974922896	0.132882691
India	0.220770143	0.466347787	0.393519778	0.821833579	0.381952925	0.794206198	1
Nepal	0.46011002	0.333124232	0.40001921	0	0.388443716	0	0.015309847
Bhutan	0.667750661	0	1	0.713659794	1	0.752863857	0.000298003
Maldives	1	0.762173606	0.618870764	0.917415317	0.616273818	0.908576884	0
Sri Lanka	0.461872778	0.396638699	0.494661181	0.752687776	0.449972397	0.691547951	0.015371607

All the values are normalized. After obtaining normalized valued a deviation sequence is generated between comparable sequence and reference sequence to measure grey co-efficient in Table 4.

Step 4: Obtaining absolute values by calculating Deviation sequence from desires value.

$$\Delta 0(\gamma) = |x0 * (\gamma) - x1 * (\gamma)|$$

Table 4: Deviation Sequence

Country	Labor force participation rate for ages 15-24, female (%) (modeled ILO estimate)	Labor force participation rate for ages 15-24, male (%) (modeled ILO estimate)	Labor force participation rate, female (% of female population ages15-64) (modeled ILO estimate)	Labor force participation rate, male (% of male population ages 15-64) (modeled ILO estimate)	Labor force participation rate, female (% of female population ages15+) (modeled ILO estimate)	Labor force participation rate, male (% of male population ages15+) (modeled ILO estimate)	Labor force, total
Pakistan	0.515788834	0	0.671138361	0	0.678003245	0	0.858089032
Afghanistan	1	0.051282051	1	0.464138439	1	0.398406521	0.984576111
Bangladesh	0.406771419	0.294754175	0.452478909	0.036413844	0.466483765	0.025077104	0.867117309
India	0.779229857	0.533652213	0.606480222	0.178166421	0.618047075	0.205793802	0
Nepal	0.53988998	0.666875768	0.59998079	1	0.611556284	1	0.984690153
Bhutan	0.332249339	1	0	0.286340206	0	0.247136143	0.999701997
Maldives	0	0.237826394	0.381129236	0.082584683	0.383726182	0.091423116	1
Sri Lanka	0.538127222	0.603361301	0.505338819	0.247312224	0.550027603	0.308452049	0.984628393
Min	0	0	0	0	0	0	0
Max	1	1	1	1	1	1	1

Deviation sequence measures how much the values of comparable sequence differ from the reference sequence. If the value of deviation sequence is close to 1, it shows that comparable.

sequence is distant to the reference sequence and if the value is close to 0, it describes that they are non-distant to each other

Step 5: Establish a co-efficient matrix of grey relation system using the following formula.

$$(\gamma)\Delta_0 = \frac{\Delta_{min} + \xi\,\Delta_{max}}{\Delta_0\,(\gamma) + \xi\,\Delta_{max}}$$

Table 5: Grey Relational Coefficients

Country	Labor force participation rate for ages 15-24, female (%) (modeled ILO estimate)	Labor force participation rate for ages 15-24, male (%) (modeled ILO estimate)	Labor force participation rate, female (% of female population ages15-64) (modeled ILO estimate)	Labor force participation rate, male (% of male population ages15-64) (modeled ILO estimate)	Labor force participation rate, female (% of female population ages15+) (modeled ILO estimate)	Labor force participation rate, male (% of male population ages 15+) (modeled ILO estimate)	Labor force, total
Pakistan	0.492228289	1	0.426935037	1	0.424447048	1	0.368164375
Afghanistan	0.333333333	0.906976744	0.333333333	0.518597724	0.333333333	0.556540929	0.336796474
Bangladesh	0.551406881	0.629125351	0.524946007	0.932116137	0.517339265	0.952241102	0.365733062
India	0.39086017	0.483721695	0.45188336	0.737282154	0.447208361	0.708422203	1
Nepal	0.480820096	0.42849463	0.454553393	0.333333333	0.449819777	0.333333333	0.336770604
Bhutan	0.600781493	0.333333333	1	0.635857096	1	0.669222075	0.333399569
Maldives	1	0.677666188	0.567453649	0.858244328	0.565786111	0.845418426	0.333333333
Sri Lanka	0.481636537	0.453160719	0.497344766	0.669064394	0.476177958	0.61846587	0.336784614

Values of Table 5 shows the Grey relational coefficients and these are calculated after the deviation sequence where ξ is distinguishing coefficient and its value is taken as 0.5, [0,1].

Step 6: Calculate GRA grade. Gray relational grade is calculated after coefficient obtained

$$\gamma\,(x_0, x_1) = \sum_{k=1}^{n} \beta_k$$

$$\gamma[(x_0, (1), x_1(\gamma)]$$

Table 6: Grey Relational Grade

Country	GRG	Rank
Pakistan	0.75388396	2
Afghanistan	0.531025899	7
Bangladesh	0.715665249	4
India	0.675100471	5
Nepal	0.450740027	8
Bhutan	0.731614971	3
Maldives	0.775664326	1
Sri Lanka	0.565221577	6

Grey relational grades are equal to the weighted sum of the values and these grades indicate the correlation between the reference sequence and comparable sequence. Grey Relational Grade is computed by obtaining the average of the Grey Relational coefficient. And the criteria weight equal to each other.

Interpretation of GRA results

Table 6 reflects the Grey Relational Grades (GRG) obtained as the result of analysis of Labor Force Participation Rate (LFPR) indicators in the SAARC countries. The results indicate that the level of labor market performance disparity in the region is high.

The highest GRA value of the eight countries was received by Maldives indicating that it has the greatest labor force participation and general economic inclusiveness in the country. Others that followed behind in the third and fourth positions were Sri Lanka and Bhutan with rather higher gender balanced employment rate and working participation. India, Bangladesh, and Pakistan were in the middle with moderate workforce participation and vast gender gaps and a non-youth participation. On the other hand, Nepal and Afghanistan were the lowest GRAs and they also took last positions in the list, which shows that they have less organized structures of the labor force, less female employment, and formal employment.

DISCUSSION

The current study provides several theoretical and empirical insights into the explanation of the labor force participation rates (LFPR) and the socioeconomic determinants that define the same in the SAARC region. The use of the Grey Relational Analysis (GRA) also contributes greatly to the aspect of theory because it offers a general approach to think about LFPR, namely when the data to be perceived is incomplete or inconsistent. Non-linear and multidimensional nature of GRA as compared to the approaches of traditional statistics allows the variables to be analyzed more in a holistic manner. The chosen strategy not only emphasizes the performance of the labor force involvement in various countries but also enables the attainment of the effective comparisons and ranking of the performance. Moreover, this paper contributes to the general concept of gendered inequities in the workforce involvement that concern the effect of the sociocultural and economic training on the involvement of women. The analysis of LFPR separately in males and females helps in the current study to show the significance of considering gender-specific policy in achieving equality in the labor market.

Regarding practical implications, the results are multi-dimensional and can be used as the guide by the policymakers, educators, and economic planners within the SAARC region. The association between education level and labor force participation, in particular female, indicates that the key to empowering the youth and increasing workforce participation is to increase access to education, especially STEM. Governments and schools should strive to dismantle economic obstacles to primary schooling and pay attention to ensuring that women have opportunities in the new economy.

Inclusive economic policies are also pointed out in the study. The results indicate that to improve the participation of labor, it is necessary to use positive economic policies such as tax incentives, access to credit, and relaxed regulations on small and medium enterprises (SMEs). These should be taken into consideration by policy makers to facilitate employment especially in under served regions and diversify jobs.

The study has however limitations. The use of secondary sources of data is also a problem since some parts of the data can be obsolete or incomplete, which will impact the quality of the outcome. Primary data collection or newer and more exhaustive data could be utilized in the future studies. Also, this study is cross-sectional and therefore has no capacity to reflect the fluidity of labor force participation with time. Long-term studies would give more information on the dynamics of LFPR changes and the effects of different intervention policies.

FUTURE RECOMMENDATION

It is possible to suggest some recommendations after the findings and limitations of the current study in order to enlighten the knowledge and raise the level of participation in labor force in SAARC region (LFPR). Those recommendations are addressed to policy makers, researchers, and educational centers and the aim is to facilitate positive interventions and researches in this sector.

The future research should focus on ensuring that the labor market research is more accurate and comprehensive by improving quality of data and access to data. The governments and the international organizations should come up with the idea of investing into sustainable data-collection systems to ensure that they have the up to date comprehensive and disaggregated information on the labor force participation. Since gender differences in the number of people actively involved in the labor market are strong as demonstrated in this paper, future studies ought to explore gender-specific barriers and facilitators in greater depth. This involves the analysis of how women are influenced by the effects of gender specific policies, cultural practices, and family demands to join the labor force. To supplement the quantitative results, the research must incorporate qualitative approaches in the future by examining sociocultural and psychological aspects that determine labor force participation. The interviews, focus groups, and case studies might reveal more about personal and community opinion and make some light on the motivations, challenges, and desires of various demographic groups.

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