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ORIGINAL RESEARCH ARTICLE

A Probe into the Wages and Salaries of Health Economics, Outcomes Research, and Market Access Professionals

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Abstract

Objective To estimate the central tendency and spread of health economics, outcomes research, and market access (HE/OR/MA) professionals' wage-and-salary earnings; compare male versus female and US versus non-US earnings levels; and examine inequality in their distribution.

Methods Self-reported survey data were collected in 2015 from HE/OR/MA professionals in the HealthEconomics.com global subscriber list. The study design consisted of a two-way classification model with multiple replications and three inequality indicators. HE/OR/MA professionals from the HealthEconomics.com global subscriber list completed a questionnaire. The sample consisted of 403 participants.

Results Within each location, men earned higher wages and salaries than women, and within each gender, HE/OR/MA professionals living in the USA earned higher wages and salaries than those living outside the USA. Evidence of a gap was suggested by the presence of gender and location disparities in earnings determinants. Results also suggested the presence of moderate inequality that was similar for both genders and greater for non-US than US residents.

Conclusions This study shed light into the labor market structure of HE/OR/MA professionals and may be conducive to more rational and efficient workforce management policies.

Key Points for Decision Makers

Men earned higher wages and salaries than women.

Within each gender, professionals living in the USA earned higher wages and salaries than those living outside the USA.

Earnings inequality within gender was similar for both men and women, but respondents living outside the USA showed more inequality than those living in the USA.

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1 Introduction

Health economics (HE), outcomes research (OR), and market access (MA) professionals configure one of the most innovative and fastest growing segments of the health sector workforce [1]. The demand for their services originates in the need of pharmaceutical companies to justify effectiveness and price and ensure their products' acceptance and preference by healthcare providers, patients, and third-party payers over competing products. The demand for their services also is rooted in the ever-present efforts by national and regional healthcare systems to establish resource-allocation priorities (within the health sector as well as health versus other economic sectors) that affect spending, performance evaluation, and the distribution and price regulation of medications [2]. Ultimately the main output of HE/OR/MA professionals lies in their search for value, which may include examining clinical practices, patients' quality of life, budget considerations, utilization of resources, willingness and ability to pay, and multiple other pursuits to determine better and more cost-effective therapeutic alternatives under different scenarios. As society and its institutions place more emphasis on market transactions and objective evaluations,

the demand for HE/OR/MA professionals' services will continue to grow.

2 Conceptual Framework

The collective worth of a profession or group of professionals is largely measured by the wages and salaries they earn. Of all the rewards offered by employers in return for their workers' contributions toward attaining organizational goals and objectives, pay is the critical indicator used as an incentive for performance and retention of worthwhile workers [3, 4]. A profession in which its members receive high wages and salaries is generally perceived as one in which the economic system places a high regard on the activities conducted by its members. Relatively high wages and salaries earned within a profession convey the image that a worker is capable of coping with the pressures of the labor market and successfully surmounts the obstacles posed by peers, employers, clients, and a wide array of individuals and institutions interacting with one another in complex ways.

2.1 Earnings Levels and Related Variables

Besides the number of hours worked, differences in wages and salaries within an occupation are influenced by the interaction of three sets of forces: human capital, job-related preferences, and employers' characteristics that include job specifications and other constraints. All three sets are affected by gender. The literature is replete with studies showing that within individual professions of the health sector, men earn higher wages and salaries than women after adjusting for pertinent variables such as number of hours worked, experience, special skills, choice of practice, and others [5–16]. According to the Institute for Women's Policy Research [17], the median gender earnings ratio in 2017 for full-time female workers in the USA was 81.8%, that is, compared with men, a gap of 18.2%. The highest paid occupations show the largest gender gaps and the lowest paid occupations show the smallest gaps [18].

Several reasons have been formulated to explain, at least partially, the gender earnings gap. Women experience more interruptions in their careers than men because of greater household, childrearing, and caregiving responsibilities traditionally assigned to them by societal norms [19–22]. This negatively affects their acquisition of special training, work experience, and other forms of human capital, which leads to lower earnings, fewer promotions, and less accessibility to management positions. The commitment, effort, and long hours of work demanded by many of the highest-paid occupations are not compatible with historically gendered family responsibilities. In fact, there is evidence of a motherhood penalty, whereby working women experience disadvantages in pay and perceived confidence relative to childless women, along with a fatherhood premium showing increases in men's earnings when they have children [23–27].

The disproportionate embrace by women of caregiving responsibilities also leads them to develop different sets of tastes and preferences for job characteristics than those exhibited by men [28]. Women seem to be relatively less interested in jobs that promise promotion opportunities and higher wage and salary earnings, often associated with stress, than in jobs that provide scheduling flexibility [29, 30], a pleasant job atmosphere [31], support from supervisors [32], and proximity (distance and/or time) of residence to job site [33–35]. These different sets of tastes and preferences may lead women to assess their career satisfaction less by the wages and salaries they earn than by subjective criteria such as relationship with coworkers and clients [9, 36].

Other arguments that have been formulated to explain the gender earnings gap include differences in perceived pay entitlement, with men more likely than women feeling worthy of higher pay [37]; men negotiating contracts and work conditions more aggressively than women [14, 38, 39]; and men's greater disposition to assume risks [40]. Stereotypes [41, 42] also contribute to the gender earnings gap in two distinct but complementary ways. One is through cultural beliefs that portray men as possessing greater intrinsic economic value and capability than women, thus rationalizing their wider access to leadership positions, higher wages and salaries, and more frequent promotions [7, 10, 43–45]; forcing women to meet higher performance standards at work than their male counterparts [46]; and encouraging female workers who want to succeed professionally and financially to present themselves as atypical women [42]. The other is by perpetuating women's own perceptions of inferiority when they have to choose between career and family, a choice that most men are not forced to make [22].

2.2 Earnings Inequality

The spread of the distribution of wages and salaries, which shows the extent of inequality, has been rising throughout most developed countries in recent decades [47–49]. In the USA and the UK it has been attributed primarily to differences among occupations [50, 51]; patterns of variation in education, skills, the demand for services, and ability to maintain institutional mechanisms of social closure such as licensing, credentialing, and unionization seem to be largely responsible for inter-occupational disparities in wages and salaries [52]. Recently, however, intra-occupational dispersion has grown at an increasingly faster rate [53, 54].

Since most of the education, skills, demand for services, and ability to maintain institutional mechanisms of social change are not prone to vary widely within occupations, wage and salary disparities are attributed primarily to differences in the number of hours worked, productivity, job-related preferences, and/or institutional rigidities such as market bias or discrimination, all of which contribute to greater within-occupation heterogeneity. Xie et al [18] point out that some occupations, such as medicine and law, have become more heterogeneous over time; this trend may be influenced by the increasing complexity of their practice, which creates different areas of specialization. Gender also may affect inequality within an occupation; several studies have found greater inequality in the distribution of men's than women's wages and salaries [55–57].

3 Aims of the Study

Within the context of the ideas expressed in the Introduction and Conceptual Framework sections above, this study sought to accomplish three purposes: (1) estimate the central tendency (e.g. earnings levels) and spread (e.g. inequality) of HE/OR/MA professionals' wages and salaries, (2) compare simultaneously their male versus female and US versus non-US earnings levels, and (3) examine inequality in their distribution within each gender and location. Gender and location comparisons were also conducted for selected variables hypothesized to affect HE/OR/MA professionals' earnings.

4 Methods

This study was based on wages and salaries data voluntarily self-reported during January–March 2015 by HE/OR/MA professionals from the HealthEconomics.com global subscriber list. Participants were asked to disclose the annual earnings received from their professional work. They were also asked about gender, country where they worked, age, highest academic degree attained, whether they worked full time or part time, type of work performed, primary job level, employer's main area of operation, level of satisfaction with current income, and current job-related stress level.

Annual earnings, not including bonuses, were reported in US dollars and age was reported in years. No instructions were given to non-US residents for converting their earnings into US dollars. The categories for highest academic degree attained were baccalaureate (BA and BS), masters (MA, MS, MBA, and MPH), doctoral (PhD, MD, and PharmD), and other. The categories for type of work performed were health economics and outcomes research (including patient-reported outcomes and health-related quality of life), market value or market access (including medical affairs, pricing, reimbursement, marketing, and advertising), technical operations (including medical writing, communications, biostatistics, epidemiology, information technology, and database analysis), academia, and other.

The categories for primary job level were top executive (chief executive officers or CEOs, presidents, vice-presidents, and academic deans), director (including chief and senior officers), associate or assistant director, manager, analyst (including specialists and research assistants), faculty member, and other. The categories for employer's main area of operations were pharmaceutical or biotechnology firm, contract research or consulting organization, academia, medical device firm, managed care (including insurance and pharmacy benefit) organization, self-employed, and other. The level of satisfaction with current income was measured with a yes/no dichotomous response, and the job's stress level was measured using a 1–10 scale, 10 showing the highest stress level.

4.1 Earnings Levels and Related Variables

A two-way classification model with multiple replications was designed to probe the nature of differences in earnings. One classification consisted of both genders ($i = 1, 2$). The other classification distinguished between professionals living in and outside the USA ($j = 1, 2$). Previous studies have shown that the gender earnings' gap is greater in the liberal economies of English-speaking countries, particularly the USA, than in the corporatist economies of Continental Europe [58]. Within each gender-location cell, n_{ij} replications were observed. This design posed the advantage of allowing not only gender and location differences to be tested simultaneously and independently of each other, but also allowing testing of a gender-location interaction effect. The design has been applied successfully in the analysis of variations in earnings and other variables in the pharmacist workforce [59].

The linear additive model was

$$X_{ijk} = \mu + \gamma_i + \lambda_j + (\gamma\lambda)_{ij} + \varepsilon_{ijk},$$

where X_{ijk} was the annual earnings reported by the kth professional in the jth location and the ith gender; μ was the overall mean; γ_i was the systematic effect of the ith gender; λ_j was the systematic effect of the jth location; $(\gamma\lambda)_{ij}$ was the gender-location interaction effect; ε_{ijk} was the stochastic disturbance (random error) term of the kth professional in the jth location and the ith gender; and where $i = 1$ for men and $i = 2$ for women; $j = 1$ for professionals living in the USA and $j = 2$ for professionals living outside the USA; and n_{ij} was the number of professionals of the ith gender and the jth location reporting their annual earnings.

The same format was used for the estimation of variables hypothesized to influence gender and location differences in wages and salaries. Age was measured in years (mean and standard deviation), job-related stress was measured using a 1–10 intensity scale, and for the other variables a percentage composition was provided.

4.2 Earnings Inequality

Inequality in the distribution of wages and salaries was analyzed using three measures of spread: the lower median share, the 90–10 decile ratio, and the Gini coefficient. Each indicator focuses on a different aspect of diversity; each possesses its own, unique sensitivity to earnings variation, usually considered strengths, as well as flaws in terms of ups and downs that may go undetected or even remain unmeasured. Consequently, analysts frequently estimate several indicators to get a more comprehensive view of the distribution of earnings being probed [60, 61] and the extent to which the indicators portray a congruent picture [62].

The lower median share is the simplest of the three measures of inequality analyzed here. It refers to the percentage of the total income earned by the lower half of HE/OR/MA professionals arranged in descending order of reported earnings. Greater values of this indicator denote less disparity. While it presents a view of how earnings are split down the middle and it is easy to calculate, the lower median share fails to shed light on the nature of the distribution within either half of earners [63].

The 90–10 decile ratio focuses exclusively on the levels of earnings observed at both ends of the array. It measures the ratio of aggregate earnings reported by the top 10% to the lowest 10% of HE/OR/MA professionals. Greater values of this indicator reveal more disparity in how earnings are distributed [64].

The Gini coefficient is the most frequently used measure of inequality [65–67]. It is also the most complex of the three indicators and is computed by averaging the differences between all possible pairs of earnings levels in a data set. Its precise derivation from the Lorenz curve has been presented elsewhere [55, 56]. Higher values are indicative of greater inequality. The Gini coefficient is more sensitive to changes in the middle of the distribution than changes at either end; thus, it is unable to identify different kinds of inequality [68].

5 Results

A total of 403 HE/OR/MA professionals (approximately 2% of HealthEconomics.com subscribers) participated in the study by providing answers to all relevant questions. The number of observations compared favorably with those reported by similar undertakings [69–71]. Of these respondents, 230 were men (57.1%) and 173 were women (42.9%), and 263 lived in the USA (65.3%), while 140 lived outside the USA (34.7%). The male-female participation ratios were similar in both locations. Of the 140 respondents living outside the USA, 56 were from the UK (40%), 40 were from the rest of Europe (28.6%), eleven were from Canada (7.8%), nine were from Asia (6.4%), five were from Australia (3.6%), and the additional 19 respondents were from other parts of the world (13.6%).

5.1 Earnings Levels and Related Variables

The estimated median, mean, and standard deviation values by gender and location reportedly earned by HE/OR/MA professionals are presented in Table 1. The median and mean values were similar to each other within each gender-location classification as well as for the aggregate estimates, with a difference no greater than 8% in any of them, which suggests that the reported earnings were normally distributed. Within each location, men earned higher wages and salaries than women and within each gender, HE/OR/MA professionals living in the USA earned higher wages and salaries than their counterparts living outside the USA. Both gender and location differences were significant, but no interaction effect was detected.

The estimated overall gender gap was virtually identical for the median (15.4%) and the mean (15.6%). It was greater for respondents living in the USA (26.7% for the median and 16.7% for the mean) than for respondents living outside the USA (11.2% for the median and 10.5% for the mean). The empirical evidence revealed that, compared to USA men's median reported wages and salaries, USA women earned 73.3% (earnings gap of 26.7%), non-USA men earned 60.0% (earnings gap of 40.0%), and non-USA women earned 53.3% (earnings gap of 46.7%). The comparisons were less unequal when the reported wages and salaries mean was used as the indicator: 83.3% (earnings gap of 16.7%) for USA women, 67.9% (earnings gap of 32.1%) for non-USA men, and 60.8% (earnings gap of 39.2%) for non-USA women.

These estimated earnings gaps were unadjusted. They might have been influenced by differences in the number of hours worked, human capital, job-related considerations, and/or employer's characteristics. Some estimated values of variables commonly hypothesized to contribute to disparities in wages and salaries are presented in Table 2. Age, for example, portrayed the same pattern as earnings: within each location men were older than women ($p = 0.007$), and within each gender HE/OR/MA professionals living in the USA were older than those living outside the USA ($p \leq 0.001$); there was no significant gender-location interaction effect. The same applied to variations in the percentage of highest academic degree attained: within each location men

Table 1 Number of observations and estimated values of the median, mean, and standard deviation of health economics, outcomes research, and market access professionals' annual earnings (in USA dollars) by gender and location

Location	Indicator	Gender		
		Men	Women	Both genders
USA	Number of observations	152	111	263
	Median ($)	187,500	137,500	162,500
	Mean ($)	177,138	147,635	164,686
	Standard deviation ($)	69,720	62,512	68,229
Non-USA	Number of observations	78	62	140
	Median ($)	112,500	100,000	112,500
	Mean ($)	120,353	107,661	114,732
	Standard deviation ($)	71,937	58,646	66,454
Both locations	Number of observations	230	173	403
	Median ($)	162,500	137,500	137,500
	Mean ($)	157,880	133,309	147,333
	Standard deviation ($)	75,307	63,941	(71,611)

Mean income differences between genders: $F=9.00$ ($p=0.003$). Mean income differences between locations: $F=47.33$ ($p\leq 0.001$). Gender-location interaction effect: $F=1.43$ (not statistically significant)

possessed a higher percentage of doctoral degrees than women, and within each gender participants living in the USA showed a higher percentage of doctoral degrees than participants living outside the USA.

The percentage of non-USA participants working part time was greater than the percentage of those living in the USA, but there were no significant gender differences within location. In terms of type of work, however, a pattern similar to the one observed for earnings was recorded: within each location the percentage of health economists and outcomes research specialists was greater for men than for women, and within each gender it was greater in the USA than outside the USA. The percentage composition of primary job level also followed the same pattern: within each location relatively more male than female respondents held a top executive or director position in their place of employment, although the difference was rather small outside the USA, while within each gender the proportion of top executives and directors was greater for USA than for non-USA respondents. Finally, in terms of employer's main area of operations, the relative gender-location concentration was similar to the other categories: within each location the percentage of HE/OR/MA professionals working in pharmaceutical or biotechnology firms was greater for men than for women, and within each gender it was greater in the USA than outside the USA, although the difference in the latter was small.

The empirical evidence also revealed (see Table 3) that proportionately more men than women were satisfied with the amount of income they earned, but neither significant differences in location nor a significant gender-location interaction effect were detected; the satisfaction gap was 6.3 percentage points in the USA and 11.9 percentage points outside the USA. HE/OR/MA professionals living in the USA reported greater levels of job-related stress than those living outside the USA, but neither gender differences nor the interaction effect were found to be significant.

5.2 Earnings Inequality

The estimated values of the lower median share, the 90–10 decile ratio, and the Gini coefficient are presented in Table 4. All three indicators were consistent with one another in the picture of inequality in the distribution of wages and salaries that they portrayed. Overall inequality was moderate, and it was very similar for both genders within each location. Generally, within each gender, wages and salaries were more evenly distributed in the USA than outside the USA.

6 Discussion

Several findings may be highlighted from this probe into the central tendency and dispersion of HE/OR/MA professionals' wages and salaries. First, unadjusted earnings were greater for men than women and for USA than non-USA respondents. Further analysis into these disparities revealed that differences in the variables hypothesized to influence earnings also occurred along the same patterns. Older HE/OR/MA professionals possessed more experience, and consequently were expected to earn higher wages and salaries than their younger counterparts. So were participants who had earned a doctoral degree, worked full time, were health economics and outcomes research specialists, held positions at the top executive or director level in their firms, and worked in pharmaceutical or biotechnology enterprises. When earnings differentials are adjusted for the effect of these intervening

Table 2 Estimated values of variables hypothesized to influence health economics, outcomes research, and market access professionals' annual earnings by gender and location

Variable	Location	Gender		
		Men	Women	Both genders
Age (years)				
Mean	USA	44.5	41.4	43.2
(Standard deviation [SD])		(10.0)	(10.2)	(10.2)
Mean	Non-USA	40.4	37.9	39.3
(SD)		(8.9)	(9.4)	(9.2)
Mean	Both locations	43.1	40.1	41.8
(SD)		(9.9)	(10.0)	(10.0)
Highest academic degree attained (%)				
Baccalaureate	USA	9.9	9.0	9.5
Masters		24.3	31.5	27.4
Doctoral		60.5	55.9	58.5
Other		5.3	3.6	4.6
Baccalaureate	Non-USA	6.4	4.8	5.7
Masters		55.1	56.5	55.7
Doctoral		34.6	29.0	32.2
Other		3.9	9.7	6.4
Baccalaureate	Both locations	8.7	7.5	8.2
Masters		34.8	40.5	37.2
Doctoral		51.7	46.2	49.4
Other		4.8	5.8	5.2
Employment status (%)				
Full time	USA	99.3	99.1	99.2
Part time		0.7	0.9	0.8
Full time	Non-USA	94.9	95.2	95.0
Part time		5.1	4.8	5.0
Full time	Both locations	97.8	97.7	97.8
Part time		2.2	2.3	2.2
Type of work (%)				
Health economics and outcomes research	USA	61.0	54.5	58.3
Market value or market access		15.1	21.4	17.7
Technical operations		8.8	12.5	10.3
Academia		9.4	7.1	8.5
Other		5.7	4.5	5.2
Health economics and outcomes research	Non-USA	39.0	30.7	35.4
Market value or market access		36.6	46.8	41.0
Technical operations		9.8	14.5	11.8
Academia		12.2	4.8	9.0
Other		2.4	3.2	2.8
Health economics and outcomes research	Both locations	53.5	46.0	50.4
Market value or market access		22.4	30.5	25.8
Technical operations		9.1	13.2	10.8
Academia		10.4	6.3	8.7
Other		4.6	4.0	4.3

variables, the gender gap and location disparity may be reduced substantially or disappear altogether. Insofar as evidence of gender bias and discrimination is traditionally interpreted solely in terms of differences in earnings that remain unexplained after the effects of intervening variables are taken into consideration [5, 72, 73], there seems to be no clear-cut argument for gender or location bias.

However, this is a rather narrow interpretation. Evidence of gender bias and discrimination should not be limited to

Table 2 (continued)

Variable	Location	Gender		
		Men	Women	Both genders
Primary job level (%)				
Top executive	USA	17.1	15.3	16.4
Director		37.5	30.7	34.6
Associate or assistant director		11.8	9.0	10.6
Manager		13.2	22.5	17.1
Analyst		5.9	7.2	6.5
Faculty member		5.9	4.5	5.3
Other		8.6	10.8	9.5
Top executive	Non-USA	10.2	8.1	9.3
Director		26.9	27.3	27.1
Associate or assistant director		7.7	8.1	7.9
Manager		29.5	24.2	27.1
Analyst		16.7	24.2	20.0
Faculty member		7.7	–	4.3
Other		1.3	8.1	4.3
Top executive	Both locations	14.8	12.7	13.6
Director		33.9	29.5	32.0
Associate or assistant director		10.4	8.7	9.7
Manager		18.7	23.1	20.6
Analyst		9.6	13.3	11.2
Faculty member		6.5	2.9	5.0
Other		6.1	9.8	7.9
Employer's main area of operations (%)				
Pharmaceutical or biotechnology	USA	47.4	28.8	39.6
Contract research or consulting		27.6	33.4	30.0
Academia		9.9	7.2	8.7
Medical device		5.3	9.9	7.2
Managed care		5.3	7.2	6.1
Self-employed		0.6	5.4	2.7
Other		3.9	8.1	5.7
Pharmaceutical or biotechnology	Non-USA	35.9	27.4	32.1
Contract research or consulting		29.5	46.8	37.1
Academia		12.8	4.8	9.3
Medical device		7.7	9.7	8.6
Managed care		–	1.6	0.7
Self-employed		2.6	6.5	4.3
Other		11.5	3.2	7.9
Pharmaceutical or biotechnology	Both locations	43.5	28.3	37.0
Contract research or consulting		28.2	38.1	32.5
Academia		10.9	6.4	8.9
Medical device		6.1	9.8	7.7
Managed care		3.5	5.2	4.2
Self-employed		1.3	5.8	3.2
Other		6.5	6.4	6.5

"unexplained" disparities in the pay-setting practices of business and government agencies, but ought to be traced to earlier stages of career development leading to women's market outcomes [22]. Women do not make work and family decisions in a vacuum; their decisions are framed and conditioned by the assumptions and expectations set by parents, teachers, mentors, potential employers, supervisors, coworkers, and clients. Unfortunately, these assumptions and

Table 3 Estimated values of job-related perception indices of health economics, outcomes research, and market access professionals by gender and location

Variable	Location	Gender		
		Men	Women	Both genders
Satisfaction with current income (%)				
Yes	USA	65.8	59.5	63.1
No		34.2	40.5	36.9
Yes	Non-USA	66.7	54.8	61.4
No		33.3	45.2	38.6
Yes	Both locations	66.1	57.8	62.5
No		33.9	42.2	37.5
Job stress level (1–10 scale)				
Mean	USA	6.82	6.67	6.76
(Standard deviation [SD])		(1.87)	(1.76)	(1.82)
Mean	Non-USA	6.31	6.30	6.31
(SD)		(2.12)	(1.78)	(1.97)
Mean	Both locations	6.65	6.53	6.60
(SD)		(1.97)	(1.77)	(1.89)

Mean satisfaction with income differences between genders: $F=3.15$ ($p=0.076$). Mean satisfaction with income differences between locations: $F=0.13$ (not statistically significant). Income-location interaction effect of satisfaction with income: $F=0.29$ (not statistically significant)

Mean job-stress differences between genders: $F=0.16$ (not statistically significant). Mean job-stress differences between locations: $F=4.65$ ($p=0.032$). Income-location interaction effect of job stress: $F=0.12$ (not statistically significant)

Table 4 Estimated values of three measures of dispersion of health economics, outcomes research, and market access professionals' annual earnings by gender and location

Measure of dispersion	Location	Gender		
		Men	Women	Both genders
Lower median share	USA	0.350	0.331	0.338
	Non-USA	0.280	0.294	0.286
	Both locations	0.312	0.314	0.312
90–10 decile ratio	USA	4.56	4.66	4.66
	Non-USA	10.88	9.50	10.29
	Both locations	7.62	6.60	7.23
Gini coefficient	USA	0.213	0.225	0.224
	Non-USA	0.321	0.292	0.311
	Both locations	0.262	0.259	0.266

expectations often provide unequal opportunities for women, compared to their male peers, along the way, leading to pay differentials. Thus, the gender gap evidence suggested in this article transcends pay disparities and point to women being younger than men because they might not have broken through employment barriers in the profession until recently; women earning proportionately fewer doctoral degrees than men because they might not have received enough encouragement and support from parents, teachers, and mentors in undergraduate school or earlier in their lives; women being less than proportionately represented among health economics and outcomes research specialists because they might have been encouraged to enter lower-paying occupational subcategories; women holding relatively fewer positions than men at the top executive or director level in their firms because they might have been set back by the subtle presence of glass ceilings; and relatively fewer women working in pharmaceutical or biotechnology enterprises, where wages and salaries are higher than in other firms, because these might be traditionally male-dominated labor markets.

The second major finding from this probe into the central tendency and dispersion of HE/OR/MA professionals' wages and salaries was that women reported being less satisfied than men with the amount of income they earned. This finding refuted those of other studies reporting the so-called paradox of the contented female worker, namely, that despite earning less income than men for comparable work, women's reported job satisfaction levels regarding income and other facets of their job were consistently higher than the levels reported by their male counterparts [28, 29, 74, 75]. It also revealed a latent perception by women that they were underpaid for the work they did and an acknowledgment by them of existing gender disparities in wages and salaries.

The third major finding had to do with the similarity between genders in the three indicators of dispersion estimated for each location. Other studies [55–57] had reported, in other settings, greater inequality in the distribution of men's than women's earnings, probably due to a greater extent of competitiveness. This did not seem to be the case

for HE/OR/MA professionals. The relatively greater disparity found within non-USA respondents of both genders could largely be attributed to the wide variety of economic and administrative conditions of the countries in which they lived.

6.1 Limitations

In interpreting these results, one must take into account several limitations inherent in the study. The first limitation has to do with methodological reliance on self-reported data, which are always subject to validity and reliability criticism. Reported wages and salaries were not validated for accuracy with employers, nor were other responses such as age, level of education, type of work performed, or primary job level. Participants seemed to be representative of the population from which they were drawn, but subscribers to the HealthEconomics.com global list might have shown a different combination of socioeconomic characteristics from those possessed by their non-subscriber peers. Moreover, a sample selection bias invariably occurs when responses pertain only to persons who have made the decision to work [71]. In the final analysis, the study rested on a convenience sample, although the relatively large number of observations might have mitigated this shortcoming.

Another limitation is that the empirical work was based on cross-sectional data, which were inadequate to detect patterns of earnings growth and change in distribution over time. Reported values of wages and salaries were not adjusted for differences in the cost of living or tax structures pertaining to different locations, which might have introduced an upward bias into the estimated indicators of inequality. Respondents working in areas characterized by higher cost-of-living indices and more progressive taxation tend to be paid higher wages and salaries for comparable work, to maintain constant real income levels, thus inflating observed inequalities in the distribution of earnings. In addition, the disparities were probably augmented by the heterogeneity of government networks, healthcare delivery systems, regulations, and economic standards affecting respondents who lived outside the USA. Disparities in exchange rates and conversion techniques of earnings outside the USA into dollars also were uncontrolled sources of variation.

The configuration of the survey posed another limitation. While some of the income determinants commonly identified in the literature were considered, others were omitted. For example, data on the average number of hours worked per period of time would have made possible to formulate meaningful income determination functions within each gender-location cell and compare the estimated coefficients to detect significant differences. Similarly, the inclusion of job-preference variables such as commuting distance and/or time, availability of childcare facilities and flexible work structures, etc., or job-satisfaction variables such as availability of advancement opportunities, job security, autonomy, and support from supervisors, would have allowed the measurement of compensating differentials, that is, non-monetary incentives and disincentives for which HE/OR/MA professionals might be willing to trade off wages and salaries.

7 Conclusion

Despite its limitations, this study was successful in estimating the central tendency and dispersion in wages and salaries of HE/OR/MA professionals throughout the world, comparing simultaneously their male versus female and USA versus non-USA earnings levels and related variables, and examining earnings inequality within each gender and location. (Given the number and distribution of respondents, results were probably most indicative of USA and European HE/OR/MA professionals.) The study has shed light on the characteristics of one of the most innovative and fast-growing segments of the health sector workforce and may act as a catalyst for future research into labor market dynamics. Insofar as the study is the first of its kind, results should be considered as preliminary in nature; additional work should focus on estimating the parameters of income determination functions, further exploring the role of work preferences and constraints, and analyzing, more specifically, individual country markets, especially in Europe. Doing so is likely to provide a more comprehensive picture of the behavior of earnings that may be conducive to more rational and efficient workforce management policies at all levels, greater overall labor productivity, and higher levels of job satisfaction.

Author Contributions All authors contributed equally and are responsible for all parts of the article.

Compliance with Ethical Standards

Conflict of interest Authors Manuel Carvajal and Ioana Popovici declare that they have no conflict of interest. Author Patti Peeples is the founder of HealthEconomics.com, which publishes and owns the rights to the salary survey data.

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Ethical approval This research was exempt because respondents remained anonymous throughout the study.

Informed consent Informed consent was obtained from all individual participants included in the study when they answered the survey questions.

Data sharing policy The datasets generated for and analyzed in this study are not publicly available due to intellectual property restrictions from HealthEconomics.com, LLC.

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