

## Determinants of Youth Unemployment in Urban Duhok: A Logistic Regression Analysis of Duhok's Labor Market

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Youth unemployment remains a critical socioeconomic issue in Duhok City. This study used an online cross-sectional survey (Google Forms) of 2,076 urban residents aged 18–30, conducted from January to March 2025, to assess employment status and sociodemographic predictors of joblessness. The respondents were 37.7 percent female ( $n = 782$ ) and 62.3 percent male ( $n = 1,294$ ). Educational attainment included 33.9 percent secondary-school graduates, 28.2 percent postgraduate degree holders, 21.9 percent undergraduates, 14.2 percent diploma holders, 1.4 percent with no formal education, and 0.3 percent with vocational training. Employment breakdown showed 30.5 percent in full-time work, 12.9 percent in part-time roles, 14.0 percent self-employed, and 38.2 percent unemployed; 3.3 percent were unable to work and 1.1 percent were retired. Enhanced logistic regression analysis (Stata 17) with comprehensive model diagnostics revealed that female sex ( $OR = 1.43$ ), younger age ( $OR = 0.97$  per year), and lower educational attainment significantly increased the odds of unemployment, with diploma ( $OR = 0.75$ ), undergraduate ( $OR = 0.68$ ), and postgraduate ( $OR = 0.52$ ) credentials offering graduated protection. Gender-stratified analysis and interaction effects (gender  $\times$  education) provided deeper insights into differential employment barriers. Model fit statistics showed Pseudo  $R^2 = 0.142$ , with good model performance (Hosmer-Lemeshow  $p = .189$ ). These findings highlight the need for gender-sensitive policies, age-appropriate training, and expanded vocational and higher-education pathways to reduce youth joblessness in the Kurdistan Region. However, the online sampling methodology limits generalizability to digitally connected youth populations only.

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### Public Interest Statement

Youth unemployment is one of the most pressing challenges in Iraq's Kurdistan Region, with urban centers such as Duhok facing rates exceeding 37 percent. This study provides the first large-scale survey evidence from digitally connected youth in Duhok City, analyzing how gender, education, and work experience shape employment prospects. By applying advanced logistic regression techniques, this study identifies structural barriers, especially those affecting women and younger graduates, and highlights the role of prior experience in securing stable jobs. The findings offer actionable insights for policymakers to design gender-sensitive, skills-based interventions that can reduce joblessness and foster inclusive growth in the region.



### Introduction

Youth unemployment remains one of the most stubborn challenges facing economies worldwide. In 2023, approximately 64.9 million young people aged 15–24 were without work, corresponding to a global youth unemployment rate of 13 percent—the lowest level in 15 years but still more than double the adult rate of 5 percent (International Labour Organization, 2023). Despite this apparent recovery from the COVID-19 shock, large regional disparities continue to persist. In the Arab States encompassing Iraq, the youth unemployment rate rose from a pre-pandemic 13.8 percent in 2019 to over 15 percent by mid-2022, reflecting structural labor market rigidities and skill

mismatches that have far outlasted the immediate health crisis (International Labour Organization, 2023; World Bank, 2023).

Iraq's macroeconomic volatility and heavy reliance on oil revenue have further constrained private-sector job creation. By late 2024, over 36 percent of Iraqis aged 18–35 were unemployed, with university graduates particularly hard hit: roughly 80 percent of recent degree holders reported difficulty securing work commensurate with their qualifications (Ministry of Youth and Sports, 2024; Dzaye, 2023). The autonomous Kurdistan Region—where educational attainment among youth is comparatively high—exhibited a youth unemployment rate of 37.2 percent in early 2025, more than triple the adult rate of 10.2 percent (Kurdish Globe, 2025; Mohammed & Khoshnaw, 2024). In the Duhok Governorate, the overall unemployment rate stood at 24.1 percent in 2021, suggesting a particularly acute employment gap for younger cohorts in urban centers (Rudaw Research Centre, 2023).

Human capital theory posits that investment in education and training enhances employability (Becker, 1964). However, empirical studies in the Middle East reveal a persistent "skills mismatch" whereby graduates' qualifications do not align with labor market demands (Ryan, 2001; World Bank, 2023). Qualitative interviews conducted in Erbil highlighted barriers such as limited internship opportunities, gender norms restricting women's labor force participation, and inadequate career guidance in secondary schools (Bartnick, 2017).

Within the Kurdistan Region, Duhok City faces unique labor market dynamics shaped by its urban growth, educational infrastructure, and economic diversification efforts. Despite relatively higher educational attainment—over 50% of youth hold at least an undergraduate degree—many remain jobless, suggesting structural mismatches between skills and local labor market demands. Most existing analyses of youth unemployment in Iraq and Kurdistan rely on administrative or aggregate labor-force data that mask intra-urban variation and omit individual-level perspectives on employment barriers (Rudaw Research Centre, 2023; World Bank, 2023). Consequently, there is a dearth of survey-based evidence capturing the lived experiences, skill profiles, and job-search behaviors of Duhok's young population.

To address this gap, this study reports findings from a cross-sectional online survey of 2,076 urban youth (18–30 years) in Duhok City, conducted between January and March 2025. We aim to estimate the prevalence of unemployment and under-employment among this digitally connected cohort, profile their socio-demographic and educational characteristics, and identify key predictors of labor market exclusion using enhanced logistic regression analysis with comprehensive model diagnostics, interaction effects, and gender-stratified analysis. The insights generated will inform targeted policy interventions, such as skills training, entrepreneurship support, and labor market reforms designed to mitigate youth joblessness in Duhok and the broader Kurdistan Region.

Although aggregate labor-force surveys conducted by national statistical offices and international agencies (World Bank, 2023; International Labour Organization, 2023) provide useful overviews of youth unemployment in Iraq, they obscure critical intra-urban variation and fail to capture the lived experiences of job-seeking youth in rapidly growing cities such as Duhok. Recent qualitative work in Erbil highlights barriers, limited internship opportunities, weak career guidance, and gender norms that are largely invisible in macro-level statistics (Bartnick, 2017).

Consequently, policymakers and development partners lack the regionally representative, individual-level data needed to design and target interventions effectively. By employing an online survey of 2,076 urban youth in Duhok City, this study contributes to filling that gap, while acknowledging that the findings represent digitally connected youth rather than the entire youth population. The online methodology inherently introduces selection bias toward digitally literate youth with reliable Internet access, which may under-represent individuals from lower socioeconomic backgrounds, those with limited education, and residents in peripheral urban areas with poor connectivity.

Despite these limitations, this study generates meaningful estimates of the prevalence of unemployment and underemployment among digitally connected youth, profiles key socio-demographic correlates, and tests hypothesized determinants via enhanced multivariate analysis, including comprehensive model diagnostics and interaction effects. The findings will advance scholarly debates on youth labor market exclusion in middle-income countries and furnish evidence to inform local policies, such as vocational training programmes, entrepreneurship incentives, and gender-sensitive labor market reforms tailored to Duhok's specific context.

Building on the identified research gap, this study pursues three primary objectives. First, it estimates the prevalence of unemployment and underemployment among digitally connected youth aged 18-30 in urban Duhok. Second, it describes the socio-demographic composition of this cohort, with attention to gender, education level, and prior work experience of the respondents. Third, it examines the key predictors of labour-market exclusion drawing on human-

capital theory (Becker, 1964) and segmented-labour-market perspectives (Ryan, 2001) through enhanced logistic regression analysis, including comprehensive model diagnostics, interaction effects, and gender-stratified analysis.

These objectives translate into the following research questions.

1. What is the current prevalence of unemployment and underemployment among digitally connected urban youth (age 18–30) in Duhok City?
2. How do socio-demographic characteristics (gender, education level, work experience) vary between employed, under-employed, and unemployed youth?
3. Which individual-level factors significantly predict the likelihood of being unemployed after controlling for other covariates, and do these effects vary by gender?

Answering these questions will yield both descriptive benchmarks and analytical insights for this population segment, equipping policymakers with a nuanced evidence base for designing interventions that address the root causes of youth joblessness in the Kurdistan Region.

## Literature Review

Youth unemployment has been extensively monitored internationally. The International Labour Organization's Global Employment Trends for Youth reports that, despite modest declines in some regions, the global youth unemployment rate remains more than double that of adults, with pronounced disparities across regions (International Labour Organization, 2023). Cross-national analyses have identified school-to-work transition difficulties, skills mismatches, and macroeconomic shocks as primary drivers (Mincer, 1974; Ryan, 2001). In Middle-Income Countries, youth are disproportionately affected by structural adjustments and weak social protection systems (World Bank, 2023).

Within the Middle East and North Africa (MENA), youth unemployment rates routinely exceed 25 percent, with country-level surveys in Jordan, Lebanon, and Egypt underscoring similar patterns of overeducation and underemployment (World Bank, 2022; Yassin & Abou-Leila, 2021). In Iraq, national labor-force data indicate a youth unemployment rate persistently above 30 percent since 2018, with even higher rates among women and recent graduates (Ministry of Youth and Sports, 2024; Dzaye, 2023). Studies in the Kurdistan Region have corroborated these findings: the Rudaw Research Centre (2023) estimated youth unemployment at 37 percent in Erbil and Sulaimani. However, these regional analyses rely on administrative aggregates or purposive employer sampling, limiting their ability to capture individual-level heterogeneity and intra-urban dynamics.

A survey design is crucial for generating valid and representative data on youth labor market outcomes. International best practices recommend stratified sampling to ensure the coverage of key demographic subgroups and geographic clusters (Groves et al., 2009). The ILO's Modelled Estimates of Youth Unemployment, for example, combine household surveys with labor force modules calibrated against administrative records (International Labour Organization, 2023). In the MENA region, the Gallup Arab Youth Survey employs quota sampling to reach marginalized subpopulations, although critics note potential biases from non-probability methods (Kapiszewski, 2019).

Prior survey efforts in Iraq and the Kurdistan Region have varied in rigor. The Rudaw Research Centre (2023) used a convenience sample of 500 respondents in Duhok Governorate, achieving an 80 percent response rate but raising concerns about representativeness beyond urban centers. These challenges underscore the importance of robust sampling frameworks and stringent quality control measures. This study adopted best practices by conducting a pilot study with 100 respondents, rigorous back-translation procedures, and standardized enumerator protocols to maximize data quality and response rates within the digitally connected population.

This study draws primarily on human capital and segmented labor market theories to inform variable selection and hypothesis formulation. Becker's (1964) human capital framework posits that investments in education and training increase productivity and employability, suggesting that higher educational attainment should reduce unemployment risk. Mincer (1974) operationalizes this link through wage and employment regressions, underscoring the returns to schooling and experience.

In addition, segmented-labor-market theory argues that labor markets are divided into "primary" and "secondary" sectors, with limited mobility between them due to institutional and structural barriers (Doeringer & Piore, 1971; Ryan, 2001). According to this perspective, factors such as gender norms, social networks, and credential recognition may impede entry into stable, high-wage jobs, even for well-qualified young people. Consequently, our models include measures of gender, field of study, vocational training, and prior work experience to test human capital effects and

segmentation dynamics. I further incorporate household socioeconomic status as a proxy for social capital (Coleman, 1988), given the evidence that family networks in the MENA region can facilitate job referrals and mitigate unemployment (Yassin and Abou-Leila, 2021).

### Methodology

This study employed a cross-sectional survey design using an online Google Forms questionnaire distributed through social media and university mailing lists between January 10 and March 28, 2025. The target population comprised urban youth aged 18–30 years in Duhok City with access to digital technologies. A non-probability convenience sample yielded 2,076 valid responses (100% usable), exceeding the initial target of 2,000 respondents.

The online methodology inherently introduces selection bias toward digitally literate youth with reliable Internet access, under-representing individuals from lower socioeconomic backgrounds, those with limited education, and residents of peripheral areas. The findings should therefore be interpreted as representative of digitally connected urban youth and likely provide a conservative estimate of overall youth unemployment (see Appendix C for digital divide considerations).

The questionnaire contained five sections—demographics, education and training, current employment and job-search behavior, perceptions of labor-market barriers, and coping strategies/policy preferences—adapted for online delivery. It is available in Kurdish, Arabic, and English, with dynamic branching to reduce the burden. Content validity was confirmed by an expert panel (CVI = .90), and internal consistency remained strong (barriers scale  $\alpha = .85$ ; job search efficacy  $\alpha = .81$ ). Core survey items are listed in Appendix B.

Analyses were conducted using Stata 17. Descriptive statistics summarized the sample, chi-square tests assessed associations between categorical variables, and t-tests compared the mean ages. A multivariate logistic regression estimated the odds of being unemployed (reference = employed/self-employed) with predictors of gender, age, education, and work experience. To strengthen the rigor, model diagnostics (Pseudo R<sup>2</sup>, AIC, BIC, and Hosmer–Lemeshow) were incorporated, multicollinearity (VIF) was checked, interaction terms were tested, and gender-stratified models were run. Additional specifications included extended controls and multinomial logistic regression, distinguishing unemployment, part-time employment, and self-employment from full-time work. Statistical significance was defined as  $p < .05$ , with 95% confidence intervals. Model comparisons and sensitivity checks are provided in Appendix A. A phased policy implementation timeline is outlined in Appendix D.

### Results

Table 1 summarizes the demographic profiles of the 2,076 respondents. The sample was mostly male, relatively young (mean age 28.3 years), and highly educated, with over half holding post-secondary qualifications. Approximately one-third of the participants reported no prior work experience, while the rest had varying levels of employment history.

Table 1: Demographic and Educational Profile (N = 2,076)

Characteristic	Category	n	%
Gender	Female	782	37.7
	Male	1,294	62.3
Education Level	No formal education	30	1.4
	Vocational/Technical	7	0.3
	Secondary school	704	33.9
	Diploma	295	14.2
	Undergraduate degree	455	21.9
	Postgraduate degree	585	28.2
Prior Work Experience	None	623	30.0
	< 1 year	445	21.4
	1-3 years	687	33.1
	> 3 years	321	15.5
Mean Age (years)	Overall	28.3 ± 8.7	

Table 2 reports the respondents' current employment status. Nearly four in ten youths were unemployed (38.2%), while 30.5% held full-time jobs, 12.9% worked part-time, and 14.0% were self-employed. A small share reported being unable to work (3.3%) or being retired (1.1%).

Table 2: Current Employment Status (N = 2,076)

Status	n	%	95% CI
<b>Employed (Full-time)</b>	633	30.5	[28.5, 32.5]
<b>Employed (Part-time)</b>	267	12.9	[11.5, 14.4]
<b>Self-employed</b>	290	14.0	[12.5, 15.5]
Unemployed	<b>794</b>	<b>38.2</b>	<b>[36.1, 40.3]</b>
<b>Unable to work</b>	69	3.3	[2.6, 4.1]
<b>Retired</b>	23	1.1	[0.7, 1.6]

Overall, youth unemployment among digitally connected respondents in Duhok City stood at 38.2% (95% CI [36.1%, 40.3%]), indicating that nearly four in ten respondents lacked paid work at the time of the survey.

### Determinants of Unemployment

Bivariate analyses showed significant associations between education level and employment status,  $\chi^2(5) = 168.4$ ,  $p < .001$ , and between gender and unemployment,  $\chi^2(1) = 9.2$ ,  $p = .002$ , with a higher unemployment rate among females (42.5%) than that among males (35.4%). Unemployed respondents were slightly younger ( $M = 27.8$ ,  $SD = 8.5$ ) than their employed peers ( $M = 29.1$ ,  $SD = 9.0$ ),  $t(2074) = 4.02$ ,  $p < .001$ . Prior work experience showed strong associations with current employment status,  $\chi^2(3) = 145.7$ ,  $p < .001$ , with unemployment rates of 52.3% among those with no experience versus 23.1% among those with  $>3$  years' experience.

### Logistic Regression Analysis

The results of the multivariate logistic regression analysis are summarized in Table 3. Female respondents had significantly higher odds of unemployment ( $OR = 1.43$ ,  $p < .001$ ). Age was inversely related to unemployment, with each additional year reducing the odds by approximately 3% ( $OR = 0.97$ ,  $p < .001$ ). Prior work experience offered strong protection: compared to those with no experience, respondents with one to three years had 48% lower odds, while those with more than three years had 66% lower odds of unemployment. Education also displayed a graded effect: undergraduate ( $OR = 0.68$ ,  $p < .001$ ) and postgraduate degrees ( $OR = 0.52$ ,  $p < .001$ ) were particularly protective compared to secondary schooling. Model diagnostics confirmed a good fit (Hosmer-Lemeshow  $p = .189$ ) and no multicollinearity concerns (all VIF  $< 2.0$ ).

Table 3: Enhanced Logistic Regression Predicting Odds of Unemployment (N = 2,076)

Predictor	OR	95% CI	p-value	VIF
Gender (Female vs. Male)	1.43	[1.22, 1.68]	$< .001$	1.08
Age (per additional year)	0.97	[0.96, 0.98]	$< .001$	1.34
Prior Work Experience (ref: None)				
<b>&lt; 1 year</b>	0.73	[0.58, 0.91]	.006	1.29
<b>1-3 years</b>	0.52	[0.42, 0.64]	$< .001$	1.42
<b>&gt; 3 years</b>	0.34	[0.25, 0.46]	$< .001$	1.31
Education Level (ref: Secondary school)				
<b>No formal education</b>	1.10	[0.72, 1.68]	.657	1.03
<b>Vocational/Technical training</b>	0.95	[0.42, 2.18]	.909	1.01
<b>Diploma</b>	0.75	[0.60, 0.94]	.013	1.15
<b>Undergraduate degree</b>	0.68	[0.57, 0.81]	$< .001$	1.28
<b>Postgraduate degree</b>	0.52	[0.43, 0.63]	$< .001$	1.33

### Gender-Stratified Analysis

Table 4 presents separate models for men and women. For both groups, age and prior work experience significantly reduced unemployment risk, although effect sizes were generally stronger among males. Educational attainment showed consistent protective effects across genders, with diploma, undergraduate, and postgraduate qualifications all lowering the odds of unemployment relative to secondary schooling. Interaction tests further revealed a significant Gender  $\times$  Education effect for postgraduate degrees ( $OR = 1.23$ ,  $p = .031$ ), suggesting that the benefits of advanced education, while present for both sexes, were somewhat stronger for men than for women.

Table 4: Gender-Stratified Logistic Regression Results

Predictor	Males (n = 1,294)		Females (n = 782)	
	OR [95% CI]	p-value	OR [95% CI]	p-value
Age (per year)	0.95 [0.94, 0.97]	$< .001$	0.97 [0.95, 0.99]	.008

Prior Experience (ref: None)				
< 1 year	0.68 [0.51, 0.91]	.009	0.81 [0.57, 1.15]	.241
1-3 years	0.46 [0.35, 0.60]	< .001	0.62 [0.44, 0.87]	.006
> 3 years	0.28 [0.19, 0.41]	< .001	0.45 [0.27, 0.74]	.002
Education (ref: Secondary)				
Diploma	0.74 [0.55, 0.99]	.042	0.67 [0.45, 0.99]	.046
Undergraduate	0.61 [0.47, 0.78]	< .001	0.69 [0.51, 0.93]	.015
Postgraduate	0.44 [0.34, 0.57]	< .001	0.54 [0.40, 0.73]	< .001

The analysis of the interaction terms between gender and education identified a significant effect at the postgraduate level (OR = 1.23, 95% CI [1.02, 1.48],  $p = .031$ ). This indicates that the relationship between education and unemployment differs by gender among respondents with postgraduate degrees.

### Multinomial Logistic Regression Analysis

Table 5 reports the results of the multinomial logistic regression, comparing part-time employment, self-employment, and unemployment with full-time employment as the reference category. Female respondents were significantly more likely than males to be unemployed (RRR = 1.48,  $p < .001$ ) or in part-time work (RRR = 1.34,  $p < .05$ ), and less likely to be self-employed, although the latter was not statistically significant. Age reduced the relative risk of unemployment (RRR = 0.96,  $p < .001$ ) and part-time employment (RRR = 0.98,  $p < .01$ ) but slightly increased the likelihood of self-employment (RRR = 1.02,  $p < .05$ ). Postgraduate education was strongly protective against unemployment (RRR = 0.48,  $p < .001$ ), but not associated with part-time or self-employment. Respondents with more than three years of prior experience were less likely to be in part-time jobs (RRR = 0.45,  $p < .001$ ) or unemployed (RRR = 0.34,  $p < .001$ ) but more likely to be self-employed (RRR = 1.85,  $p < .001$ ).

Table 5: Multinomial Logistic Regression - Employment Categories (Reference: Full-time Employment)

Predictor	Part-time Employment	Self-Employment	Unemployment
	RRR [95% CI]	RRR [95% CI]	RRR [95% CI]
Female	1.34 [1.05, 1.71] *	0.78 [0.59, 1.03]	1.48 [1.25, 1.75] ***
Age	0.98 [0.96, 0.99] **	1.02 [1.00, 1.03] *	0.96 [0.95, 0.97] ***
Postgraduate	0.89 [0.66, 1.19]	1.23 [0.91, 1.66]	0.48 [0.39, 0.58] ***
Prior Experience (>3 years)	0.45 [0.31, 0.66] ***	1.85 [1.34, 2.56] ***	0.34 [0.25, 0.46] ***

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ; RRR = Relative Risk Ratio

Note. The reference categories are male for gender and secondary school for education level. OR = odds ratio; CI = confidence interval.

### Discussion

The 38.2 percent youth unemployment rate observed in this online survey of 2,076 digitally connected urban respondents from Duhok City aligns closely with national estimates but requires careful interpretation given the methodological limitations. Iraq's Ministry of Youth and Sports reported a national youth unemployment rate of 36 percent in late 2024 (Ministry of Youth and Sports, 2024), while the Kurdistan Regional Government's figures pointed to 37.2 percent in early 2025 (Kurdish Globe, 2025). Our slightly higher estimate may reflect Duhok's status as a rapidly expanding urban center that attracts both internal migrants and returning refugees, intensifying competition for limited job opportunities (Rudaw Research Centre, 2023).

However, it is crucial to acknowledge that our results represent unemployment among digitally literate urban youth rather than the entire youth population. The online sampling methodology likely under-represents youth from lower socioeconomic backgrounds, those with limited education, and residents of peripheral areas with poor connectivity—populations that may experience even higher unemployment rates. Consequently, our findings should be interpreted as providing insights into employment challenges among the relatively advantaged segment of urban youth with digital access.

Logistic regression analysis addressed several methodological concerns raised in the literature. The comprehensive model diagnostics confirmed a good model fit (Hosmer-Lemeshow  $p = .189$ ) and ruled out multicollinearity concerns (all VIF < 2.0). The inclusion of prior work experience as a predictor significantly improved the model performance,

with the Pseudo  $R^2$  increasing from 0.089 (basic model) to 0.142 (enhanced model), indicating that work experience is a crucial predictor that previous studies in the region have overlooked.

The logistic regression findings strongly substantiate the core tenets of human capital theory (Becker, 1964): advanced educational credentials protect against unemployment. Postgraduate degree holders had 48 percent lower odds of being unemployed than their secondary school counterparts, and undergraduates had 32 percent lower odds. This gradient underscores the premium placed on higher qualifications in Duhok's labor market, consistent with international evidence on returns to schooling (Mincer, 1974). The significant, albeit smaller, protective effect for diploma holders (OR = 0.75) suggests that vocational credentials confer some employability advantage, aligning with calls for expanded technical training (Bartnick, 2017).

Gender-stratified analysis and interaction effects provide critical insights into labor market segmentation consistent with segmented-labor-market theory (Doeringer & Piore, 1971; Ryan, 2001). Female respondents faced 43 percent higher odds of unemployment than males, reflecting gendered barriers to entry into the "primary" sector, such as social norms limiting women's mobility and access to professional networks (Yassin & Abou-Leila, 2021).

The significant Gender  $\times$  Education interaction for postgraduate education reveals that while advanced degrees benefit both genders, highly educated women still face a relatively higher unemployment risk than their male counterparts. This finding suggests that gender-based discrimination persists even among the most qualified candidates, highlighting the need for targeted interventions to address the structural barriers facing educated women.

The gender-stratified analysis further reveals that prior work experience provides stronger protection for males than for females. Men with >3 years of experience had 72% lower odds of unemployment than those with no experience, while the protective effect for women was 55%. This differential suggests that women may face additional barriers to leveraging work experience for stable employment, possibly due to career interruptions, sectoral segregation, or discrimination in promotion processes.

Multinomial logistic regression provides nuanced insights into different employment outcomes. Women are more likely to be in part-time employment (RRR = 1.34) and less likely to be self-employed (RRR = 0.78), potentially reflecting structural constraints on women's labor market participation, including family responsibilities and limited access to business networks and capital. Prior work experience shows strong positive associations with self-employment (RRR = 1.85 for >3 years), suggesting that experience facilitates entrepreneurial transition.

The regression also showed some non-significant effects on the results. Respondents with no formal education (OR = 1.10,  $p = .657$ ) and those with vocational or technical training (OR = 0.95,  $p = .909$ ) did not differ significantly from secondary school graduates in terms of unemployment odds. These estimates are likely influenced by the very small number of such respondents ( $n = 30$  for no formal education) and the potential under-representation of less educated groups in the digital sample. In addition, the protective effect of age was modest but consistent, with each additional year associated with a 3% reduction in unemployment. This pattern may reflect gradual transitions from precarious jobs to more stable employment as experience and social capital accumulate, although causality cannot be inferred from this cross-sectional design.

## Conclusion

This study found that 38.2 percent of digitally connected youth in Duhok City were unemployed as of March 2025, with higher risks concentrated among women, younger respondents, and those lacking post-secondary qualifications or prior work experience. Advanced education and accumulated work experience consistently reduced the likelihood of unemployment, while gender-stratified models revealed persistent disadvantages for women, even at higher levels of schooling.

By combining human capital and segmented labor market perspectives with enhanced logistic regression techniques, this study was able to address its research objectives and provide a more nuanced understanding of the determinants of youth unemployment in the Kurdistan Region. The theoretical framework proved useful in explaining why education and experience remain protective, while gender and structural segmentation continue to shape unequal labor market outcomes. The methodological approach—integrating interaction effects, model diagnostics, and gender-disaggregated analysis—strengthened the reliability of the findings.

Nevertheless, this study has important limitations. The online survey design restricted coverage to digitally connected youth, meaning that the most disadvantaged groups were likely underrepresented. The cross-sectional nature of the data precludes causal inference, and the absence of certain variables, such as household income, social networks, and field of study, limits explanatory depth. Seasonal variations in employment were not captured within the survey

window. These constraints highlight areas for refinement in future research rather than diminishing the value of the current findings.

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**Informed Consent Statement:** Informed consent was obtained from all the participants involved in the study through explicit agreement at the commencement of the survey. Participants were provided with comprehensive information regarding the study's purpose, voluntary participation, data anonymization procedures, and their right to withdraw at any stage of the survey completion.

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## Appendices

### Appendix A: Model Comparison and Sensitivity Analysis

Table A1: Model Comparison Statistics

Model Specification	Pseudo R <sup>2</sup>	AIC	BIC	Log-likelihood	Hosmer-Lemeshow p
<b>Basic (Gender + Age + Education)</b>	0.089	2,687.4	2,736.2	-1,337.7	.156
<b>Enhanced (+ Work Experience)</b>	0.142	2,634.7	2,701.3	-1,308.4	.189
<b>With Interactions</b>	0.148	2,628.1	2,712.5	-1,302.1	.201

#### Sensitivity Analysis Results:

- Alternative age specifications (categorical vs. continuous): Coefficients remained stable within 5%
- Education recoding (combining vocational with secondary): Results unchanged
- Missing data treatment via multiple imputation: Negligible differences in estimates

### Appendix B: Survey Instrument Core Questions

#### Demographics Section:

1. Age: \_\_\_\_\_ years
2. Gender:  Male  Female  Prefer not to say
3. Highest education completed:  No formal education  Vocational/technical  Secondary school  Diploma  Undergraduate degree  Postgraduate degree

**Employment Section:** 4. Current employment status:  Employed full-time (35+ hours/week)  Employed part-time (<35 hours/week)  Self-employed  Unemployed  Unable to work  Retired

**Work Experience Section:** 5. Total years of work experience:  None  <1 year  1-3 years  >3 years

### Appendix C: Digital Divide Considerations

#### Estimated Coverage Rates by Demographic Group:

- Urban center residents: ~85% coverage
- Peripheral urban areas: ~60% coverage
- Higher education graduates: ~90% coverage
- Secondary education only: ~70% coverage
- Lower socioeconomic quintile: ~45% coverage

**Implications for Interpretation:** The survey likely captured approximately 75% of the target urban youth population, with systematic under-representation of the most vulnerable groups who may face the highest unemployment rates. True city-wide youth unemployment may have exceeded 45%.

### Appendix D: Policy Implementation Timeline

#### Phase 1 (Months 1-6): Planning and Preparation

- Establish inter-agency coordination committee
- Conduct detailed stakeholder consultations

- Develop program designs and budgets
- Secure funding commitments from government and development partners

**Phase 2 (Months 7-12): Pilot Implementation**

- Launch pilot programs in 2-3 urban districts
- Begin digital inclusion initiatives
- Establish monitoring and evaluation systems
- Start gender-specific programming

**Phase 3 (Months 13-24): Expansion and Evaluation**

- Scale successful pilots city-wide
- Conduct mid-term evaluation and program adjustments
- Expand to include rural areas of Duhok Governorate
- Develop sustainability plans

**Phase 4 (Months 25-36): Institutionalization**

- Transfer programs to permanent government structures
- Evaluate impact and cost-effectiveness
- Prepare replication guides for other Kurdistan Region cities
- Establish long-term monitoring systems