

Evaluating Health Consequences of Non-standard Employment: How Do We Assess Exposure?

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ENVIRONMENTAL AND OCCUPATIONAL HEALTH SCIENCES

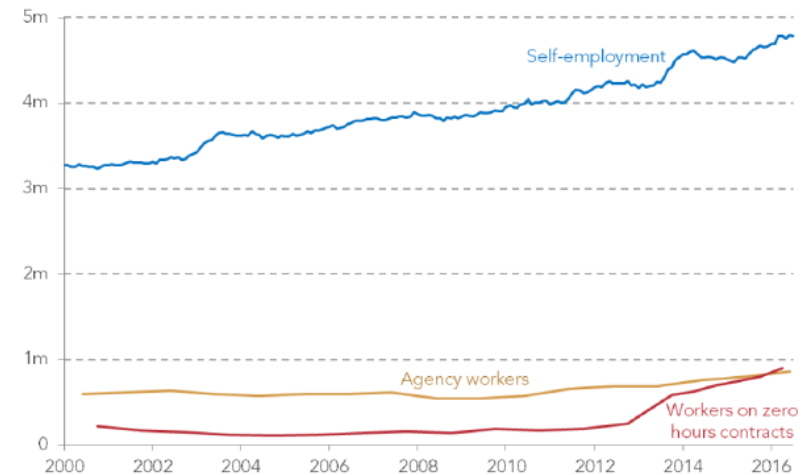
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‘De-standardization’ of employment

- Standard Employment Relationship (SER) as gold standard
 - Permanent, ongoing
 - Full-time
 - Direct employment
 - (Adequate wages/benefits)
 - (Opportunity for advancement)

Figure 6: Changing nature of work in the UK, 2000–2016



From: Eurofound (2017), *Aspects of non-standard employment in Europe*, Eurofound, Dublin.

Table 5: *Alternative work arrangements in the USA – percentage of all employed*

	2005	2015
Independent contractors	6.9	8.4
On-call workers	1.7	2.6
Temporary help agency workers	0.9	1.6
Workers provided by contract firms	1.4	3.1
Total	10.7	15.8

Source: US Bureau of Labor Statistics (2005) and Katz and Krueger (2016)

Health implications of non-standard employment?

- Linked to:
 - Increased injury rates and severity
 - Musculoskeletal symptoms
 - Poor general health
 - Poor mental health
 - Increased presenteeism
- Health evidence primarily originates from studies of non-permanent employment contracts
 - Temp, precarious, flexible, insecure, etc.

How non-standard employment impacts OH&S

- Workers may have many different jobs and worksites less familiar with site-specific hazards
 - Less accustomed to safe work practices and equipment
- Differential treatment/resources
 - ‘Less investment’ in non-permanent employees
 - Quantity/quality of training
 - Less integrated into workers’ social networks
- High hazard tasks or jobs
- Reluctant to exercise their rights/refuse dangerous work
- Diffusion of responsibility for worker OH&S
 - Identifying the employer responsible for working conditions less clear and more open to dispute

Other aspects of employment that impact OH&S

- Long hours
- Shift work
- Irregular schedules
- Mismatched working time preferences
- Low wages
- Lack of paid leave/insurance/other benefits

... standard vs. non-standard arrangement?

Aim

Improve exposure assessment of contemporary employment conditions for OH epidemiology.

- What to measure?
- **How to measure?**

Work vs. Employment Quality

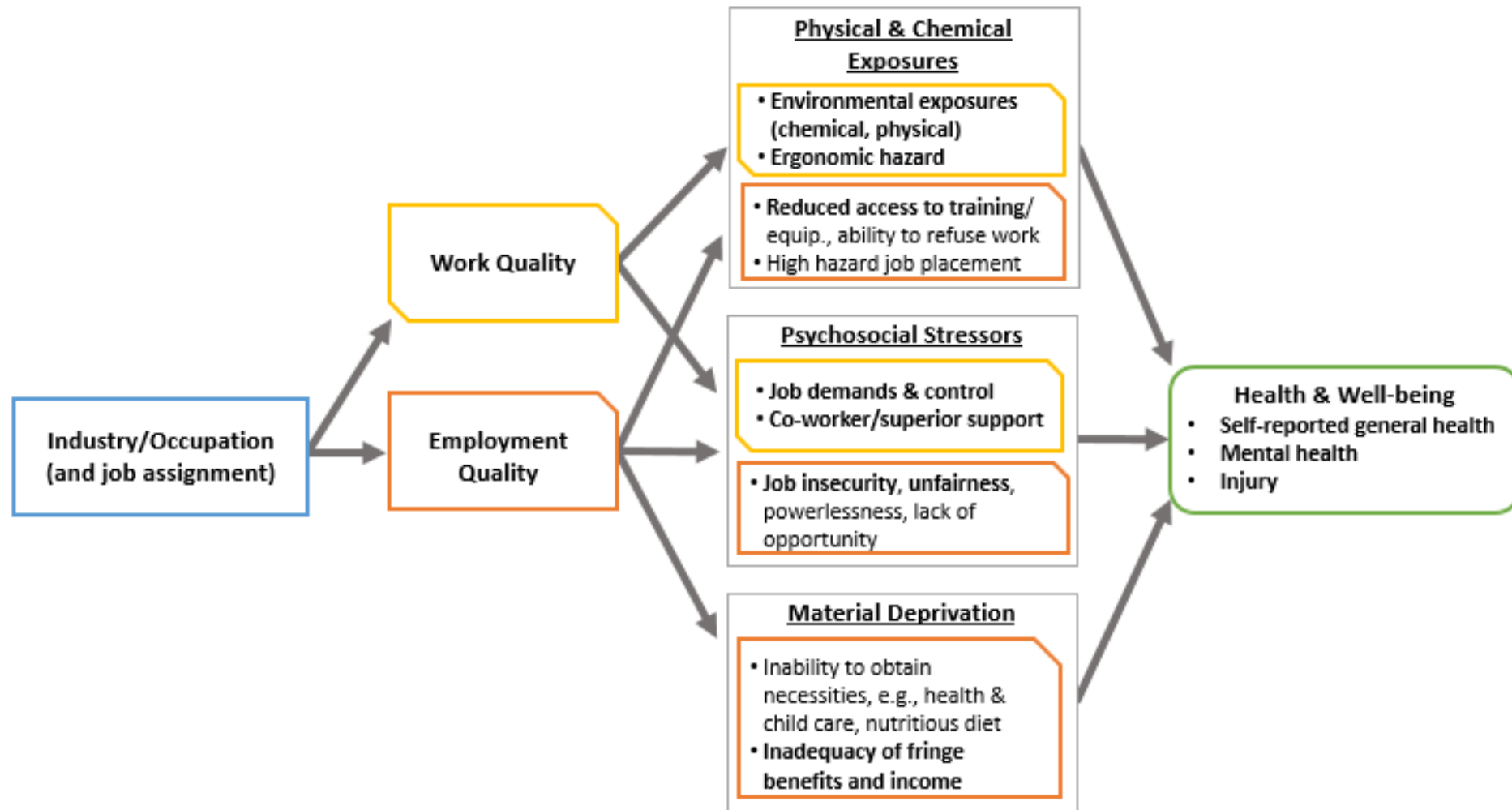
Work quality – the nature of work tasks and features of the actual physical & social environment in which work takes place

- Working conditions (e.g. physical, biochemical, psychosocial exposures)
- Job content (e.g. tasks)

Employment quality – terms and conditions of the employer-employee relationship

- Determine type of contract, material benefits, hours and schedule, mobility opportunities, and workplace power dynamics, etc.

Integrating EQ w/ Traditional OH



Data

General Social Survey (GSS)

- Quality of Worklife module
- NIOSH collaboration
- ~6000 workers
- 4 cross-sections (2002, 2006, 2010, 2014)
- Looked at wage-earners and self-employed separately

EQ Dimensions	GSS Indicators
[1] Employment stability	[1] Type of employment contract
[2] Material Rewards	[2] Income level
[3] Workers' rights & social protection	[3] Mandatory extra days of work
[4] Working time arrangements	[4] Number of working hours [5] Shift
[5] Employability opportunities	[6] Opportunities to develop abilities
[6] Collective organization	[7] Union representation [8] Adequate training, equipment, information
[7] Interpersonal power relations	[9] Employee involvement in decision-making [10] Harassment/abusive treatment [11] Control over schedule

Analytic Approach

Measurement	Approach
Multivariate regression	All EQ indicators included in a regression model.
EQ composite score	Aggregate score of # of poor EQ conditions.
EQ typology	Latent class analysis derivation of EQ types.

- EQ association with occupational injury
 - (Find similar results with self-rated health and a mental health measure)
- Poisson regression w/ robust standard errors
 - Adjusted for sex, age, race/ethnicity, nativity, education, and year

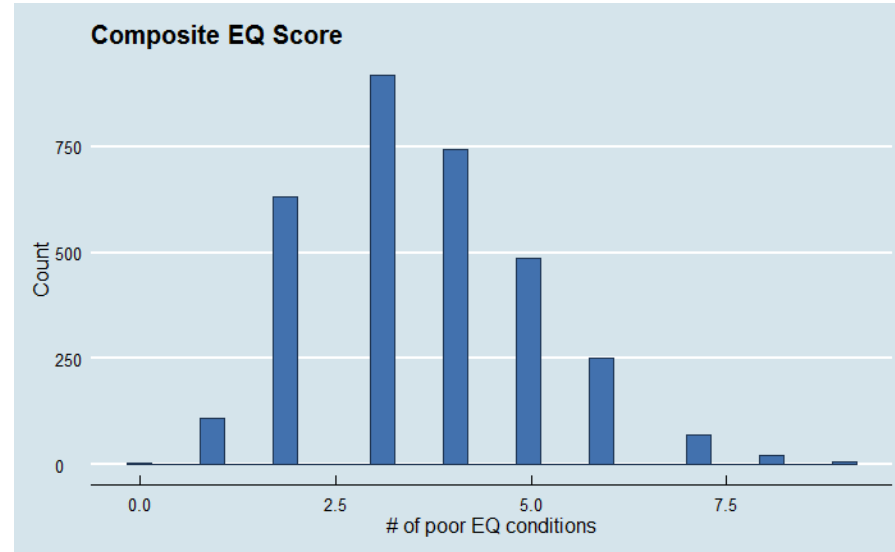
Multivariate Regression

EQ Indicator	Workplace injury	
Non-permanent arrangement (ref. = permanent)	1.13 (0.8-1.7)	
Income (ref. = lowest quartile)		
2nd/3rd quartile	0.89 (0.6-1.2)	
Highest quartile	0.67 (0.4-1.1)	
Mandatory extra days of work (ref. = none)		
1-10 days	1.00 (0.6-1.6)	
11+ days	1.47 (0.9\2.4)	
Working hours (ref. = <24 hrs)		
25-36 hrs	1.16 (0.6-2.2)	
37-48	1.28 (0.7-2.3)	
>48 hrs	1.94 (1.0-3.7)	*
Working times regularity (ref. = day shift)		
Afternoon/night shift	1.30 (0.9-2.0)	
Split/irregular/rotating	1.41 (1.0-2.0)	
Opportunity to develop abilities (ref. = very true)		
Somewhat true, opp	0.81 (0.6-1.2)	
Not true, opportunity	0.86 (0.6-1.3)	
Inadequate training, info, equipment (ref. = often/sometimes)	2.46 (1.7-3.6)	***
No union representation (ref. = yes)	0.77 (0.5-1.2)	
Control over schedule (ref. = high)		
Medium control	1.67 (1.2-2.4)	**
Low control	1.55 (1.0-2.4)	
Employee involvement (ref. = high)		
Sometimes involved	0.79 (0.6-1.1)	
Rarely/never involved	0.98 (0.6-1.5)	
Workplace harassment/threats (ref. = yes)	0.48 (0.3-0.7)	***

Notes: Ratios estimates and 95% confidence intervals are shown. All models are adjusted for age, gender, race, nativity, education, and survey year.

* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001.

Composite EQ Score



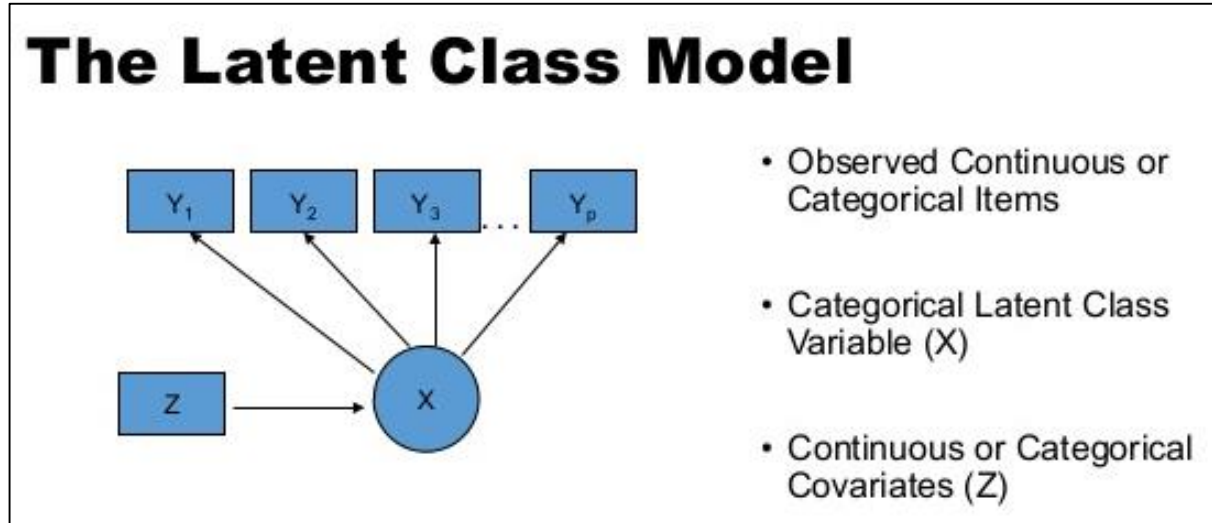
EQ Category	n	%	Social & Job-related Correlates
High EQ (0 -2 poor conditions)	744	23	Moving from High to Low EQ: Younger, more racial/ethnic minorities, more immigrants, less education; more retail and support service industries, less professional/management; more service occupations
Moderate EQ (3 - 4 poor conditions)	1661	51	
Low EQ (>5 poor conditions)	837	26	

Composite EQ Score

EQ Type	Workplace injury
<i>Ref. = High EQ (0 -2 poor conditions)</i>	
Moderate EQ (3 - 4 poor conditions)	1.19 (0.8-1.9)
Low EQ (>5 poor conditions)	1.76 (1.1-2.8) *

Notes: Ratio estimates and 95% confidence intervals are shown. All models are adjusted for age, gender, race, nativity, education, and survey year.
* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001.

EQ Typology



- Identifies latent subgroups (i.e. classes of EQ) in a heterogeneous population
- Person-oriented approach
 - Classes based on similarities in patterns of exposures
 - (As opposed to variable-oriented approaches based on correlations between variables)

Observed job types in U.S.

EQ indicator	Wage-earners						Self-employed	
	SER-like	Porfolio	Inflexible skilled	Dead-end	Precarious	Optimistic precarious	Skilled Contractor	Gig work
% of overall workforce:	22.2%	14.9%	15.3%	12.0%	11.5%	10.5%	5.3%	8.3%
Regular, permanent arrangement	0.933	0.950	0.900	0.941	0.864	0.706	0.301	0.098
Highest income quartile	0.107	0.525	0.282	0.123	0.000	0.033	0.596	0.124
Zero mandatory extra days of work	0.865	0.846	0.585	0.710	0.849	0.966	0.596	0.883
Fulltime working hours (37-48hrs)	0.907	0.418	0.257	0.634	0.440	0.071	0.275	0.255
Day shift working times	0.877	0.924	0.620	0.715	0.530	0.572	0.707	0.588
High opportunity to develop abilities	0.356	0.602	0.524	0.047	0.151	0.359	0.799	0.595
Have adequate training, info, equipment	0.950	0.925	0.904	0.563	0.820	0.961	0.968	0.912
Union representation	0.136	0.031	0.268	0.291	0.088	0.045	0.026	0.033
High control over schedule	0.317	0.739	0.119	0.142	0.066	0.522	0.563	0.671
High employee involvement	0.400	0.639	0.554	0.175	0.165	0.324	0.634	0.328
Do not experience harassment/threats	0.923	0.952	0.835	0.779	0.841	0.959	0.926	0.930

Shading: Dark: Positive characteristic

Light: Negative characteristic

Shading is relative within rows

EQ labels reflect characteristic employment conditions

EQ Typology

EQ Type	Estimated % of workforce	Social & Job-related Correlates
SER-like	22	Female; sales/office occupations; education/health industry
Portfolio	15	Older, white, male, highly educated; management and IT jobs
Inflexible skilled	15	Male, highly educated; education/health industry
Dead-end	12	Hispanic, immigrant, low education; transportation & manufacturing sectors
Precarious	12	Younger, female, non-white, immigrant, low education; retail/service sectors
Optimistic precarious	11	Young and old, female, white; retail/service sectors
Skilled contractor	5	Older, white, male, highly educated; management jobs
Job-to-job	8	Female, Hispanic; service sectors

EQ Typology

EQ Type	Workplace injury	
SER-like	(ref.)	
Portfolio	0.85 (0.4-1.7)	
Inflexible skilled	3.61 (2.0-6.4)	***
Dead-end	3.93 (2.2-7.0)	***
Precarious	2.30 (1.3-4.3)	**
Optimistic precarious	0.97 (0.5-2.1)	
Skilled contractor	2.26 (1.0-5.0)	*
Job-to-job	2.12 (1.1-4.3)	*

Notes: Ratio estimates and 95% confidence intervals are shown. All models are adjusted for age, gender, race, nativity, education, and survey year.

* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001.

Comparison

- Multivariate regression
 - Interpretation: Effect of individual EQ factors associated with health, assuming all others constant.
 - Results: Long hours, schedule control, adequate info/training/equipment, harassment assoc. w/ injury (1.67 -2.46 IRRs) .
- Composite Score
 - Interpretation: Effect of accumulation of multiple simultaneously occurring negative EQ conditions.
 - Results: Assoc. w/ injury, dose response (low EQ: 1.76 IRR).
- Typology
 - Interpretation: Effect of distinct patterns of EQ conditions.
 - Results: Different EQ types assoc. w/ injury (2.12 – 3.93 IRRs).

Comments/Discussion

- New conceptual and analytical frameworks are needed to evaluate health implications of changes in employment structure
 - Relevant aspects are complex and multidimensional
- Person- vs. variable-oriented approaches complement each other
 - Identify risk *factors*
 - Identify risk *profiles* → useful for OH research?

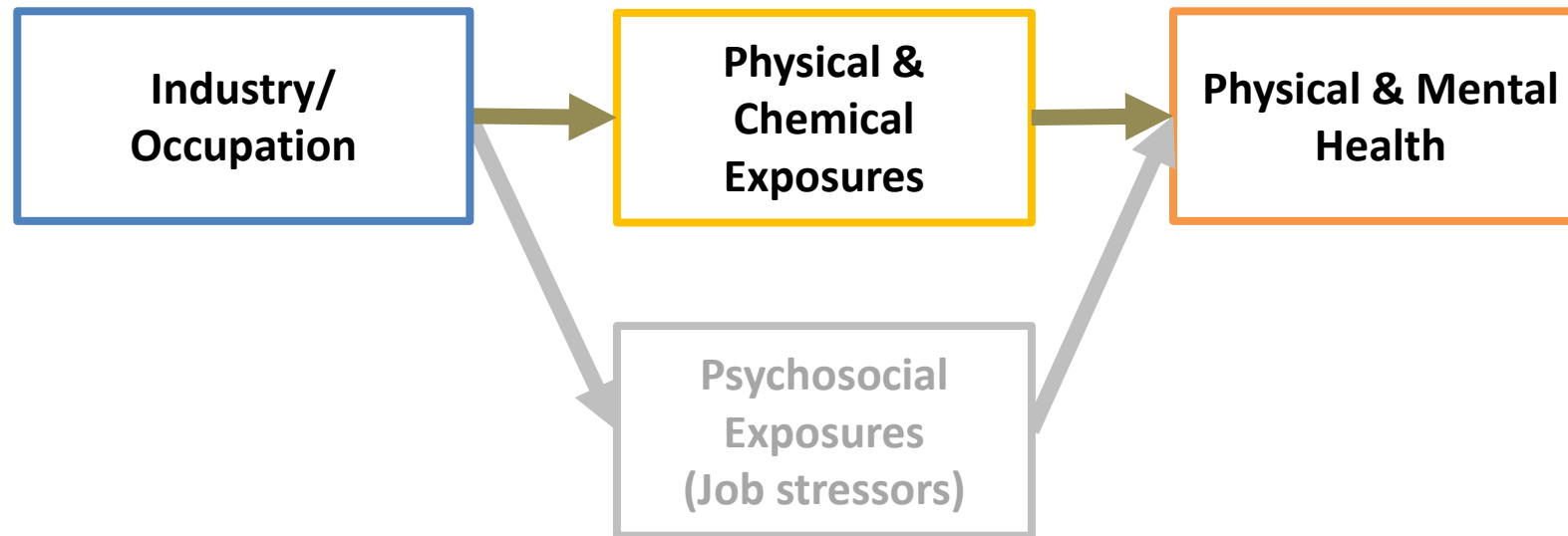
Thank you!

Questions? Thoughts?

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Need a broader model of work-related risks

- OH&S traditionally focus on specific work hazards without respect to underlying contractual and relational aspects of employment



- How to account for employment characteristics?

Multivariable Approach

Allows each dimension to be evaluated separately, providing insight as to whether certain aspects of EQ are (more) important contributors to health

Table 3
Effect of Precarious Employment Features on Low Health Status, SLID Panel 3 (2000–2004)

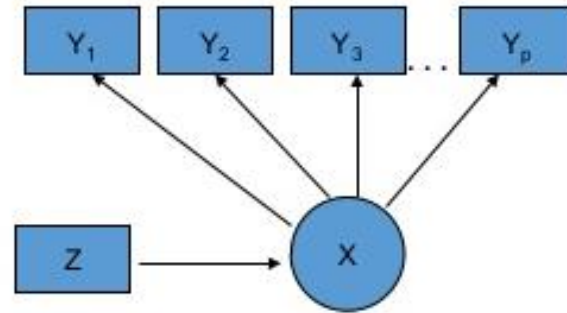
	Model 1	Model 2	Model 3
Intercept	-3.071***	-3.295***	-3.239
Certainty of Continuing Work			
Full-time Permanent ^a			
Full-time Temporary	-0.239	-0.396	-0.354
Part-Time Permanent	0.119	-0.128	-0.010
Part-Time Temporary	0.540	0.202	0.307
Control over Work Processes			
Irregular schedule		-0.043	0.002
Substantial unpaid overtime hours		0.384***	0.440***
Involuntary part-time work		0.306	0.218
Legal and Institutional Protection			
No union coverage		-0.314**	-0.316**
Income and Benefits Adequacy			
Low earnings		0.541**	0.496**
No earnings increase		0.157	0.132
No pension plan		0.241**	0.241**
No extended health plan		-0.166	-0.194
Work-Role Status			
No supervisory responsibility		0.061	0.033
Risk of Exposure to Physical Hazards			
Manual occupation		0.341*	0.207*
Socio-demographic Characteristics			
Older (= >45 years)		0.379***	
Female		-0.111	
Visible Minority		0.642***	
Married		-0.357**	
Low Education		0.246*	
Low Family Income		0.198	

^aReference category.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

(Scott-Marshall & Tompa 2011)

The Latent Class Model



- Observed Continuous or Categorical Items
- Categorical Latent Class Variable (X)
- Continuous or Categorical Covariates (Z)

- Two Parameters
 - Class proportions
 - Probability a randomly drawn person belongs to latent class X
 - Conditional response probabilities
 - Within latent class distributions of response categories
- Model selection
 - Fit statistics
 - Substantive interpretation of model output