The Oxford Health Alliance

Confronting the Epidemic of Chronic Disease

Chronic disease: an economic perspective

Annex

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Chronic Disease: An Economic Perspective (Annex)
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A note on this Annex

This is an Annex to Marc Suhrcke, Rachel A. Nugent, David Stuckler and Lorenzo Rocco, *Chronic Disease: An Economic Perspective* (London: The Oxford Health Alliance 2006, ISBN 0-9554018-1-X). Please see pp. 6–7 of that document for information about the authors, funding and other information about the publication.

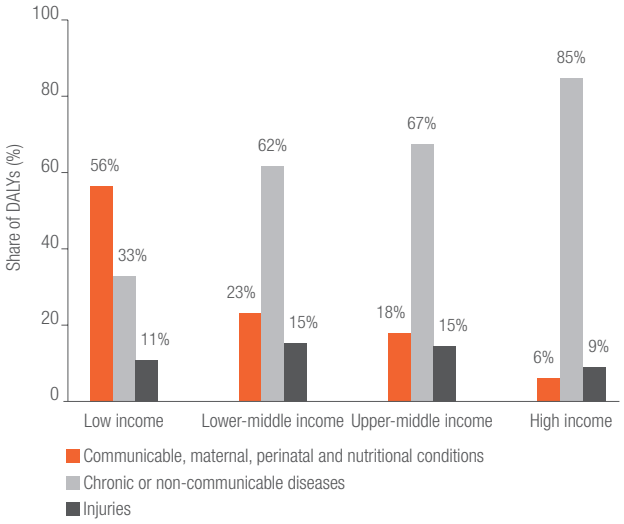
This Annex and the publication that it supports (*Chronic Disease: An Economic Perspective*) are both available on the Oxford Health Alliance website at www.oxha.org.

This Annex provides figures and tables to support the text in *Chronic Disease: An Economic Perspective*. It is referred to throughout that publication as the 'Web-Annex' (references are in the form: see Web-Annex, Figure A 1).

This Annex will appear as a pdf on the Oxford Health Alliance website: www.oxha.org/initiatives/economics.

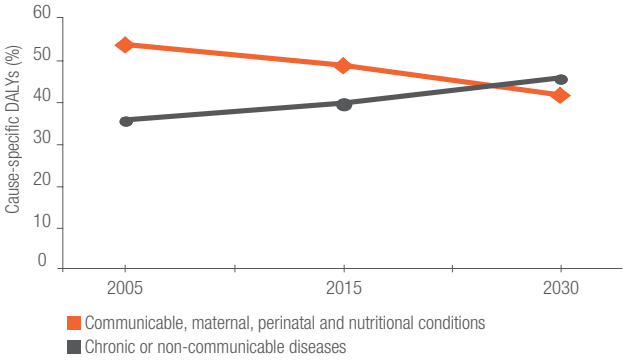
Figures

Figure A 1 Worldwide share of disability-adjusted life years (DALYs) by cause and World Bank income category (2002)



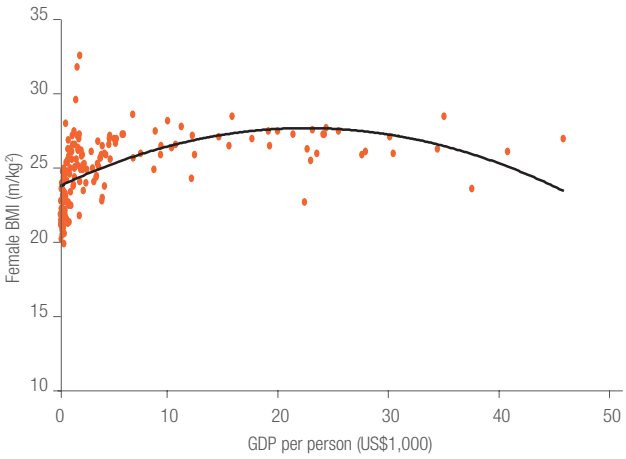
Source Mathers et al. (2003)

Figure A 2 Projections of cause-specific disability-adjusted life years (DALYs) as a percentage of total DALYs in low-income countries, baseline scenario



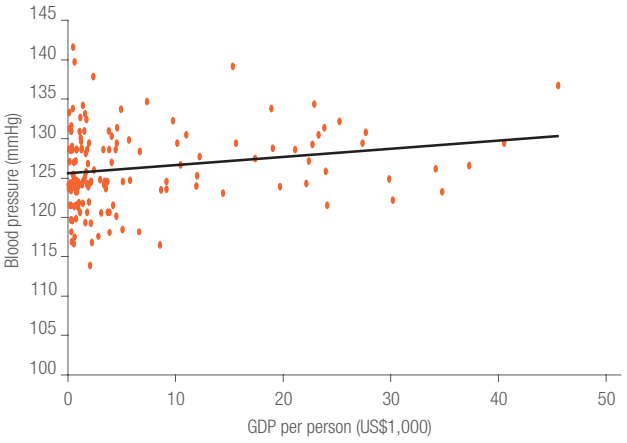
Source Mathers and Loncar (2005)

Figure A 3 Mean body mass index (BMI) among women versus gross domestic product (GDP) per person (2002)



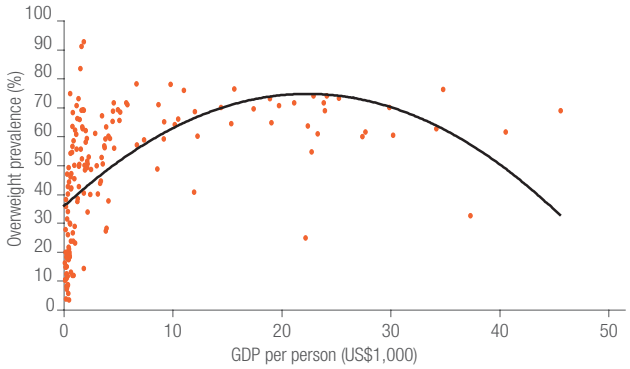
Source WHO Global InfoBase (www.who.int/ncd_surveillance/infobase; accessed 14 July 2006)
Note The sample comprises 170 countries and the robust regression results are: Female BMI = 25.0 + 0.32 GDPpc – 0.0086 $(GDPpc)^2$ (R^2 = 0.13). The coefficients are significant at the 1% level.

Figure A 4 Mean systolic blood pressure for men (age > 14) versus gross domestic product (GDP) per person (2002)



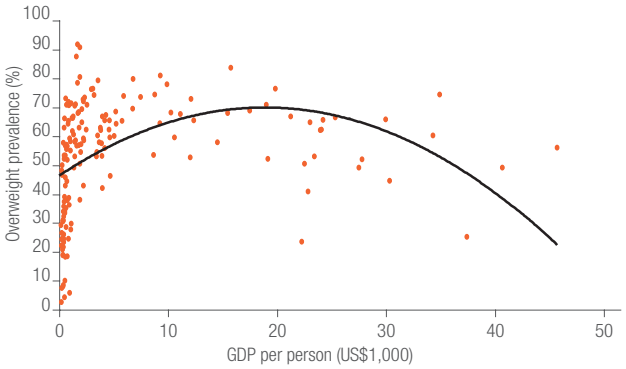
Source WHO Global InfoBase (www.who.int/ncd_surveillance/infobase; accessed 14 July 2006)
Note The sample comprises 170 countries and the robust regression results are: Male blood pressure = 125.5 + 0.103 GDPpc (R^2=0.04). The linear coefficient is statistically insignificant.

Figure A 5 Prevalence of overweight among men (age > 14) versus gross domestic product (GDP) per person (2002)



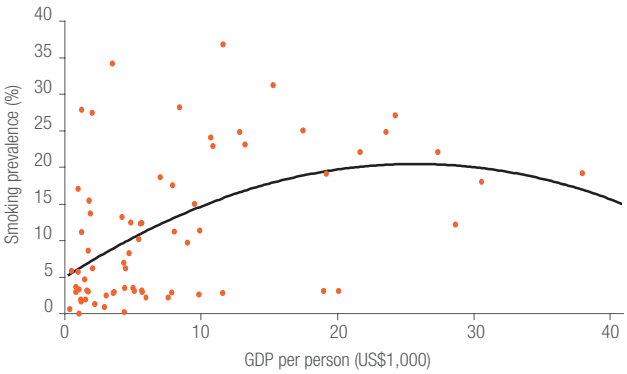
Source WHO Global InfoBase (www.who.int/ncd_surveillance/infobase; accessed 14 July 2006)
Note The sample comprises 170 countries and the robust regression results are: Male overweight = 35.4 + 3.5 GDPpc - 0.078 $(GDPpc)^2$ (R^2=0.32). The coefficients are statistically significant at the 1% level.

Figure A 6 Prevalence of overweight among women (age > 14) versus gross domestic product (GDP) per person (2002)



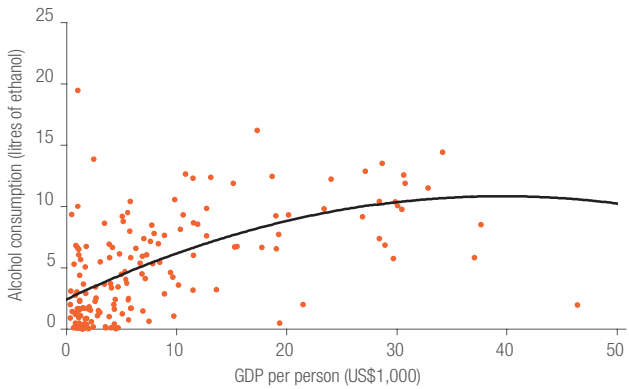
Source WHO Global InfoBase (www.who.int/ncd_surveillance/infobase; accessed 14 July 2006)
Note The sample comprises 170 countries and the robust regression results are: Female overweight = 46.5 + 2.49 GDPpc - 0.066 $(GDPpc)^2$ (R^2=0.16). The coefficients are statistically significant at the 1% level.

Figure A 7 Smoking prevalence among women (age > 14) versus gross domestic product (GDP) per person (around 2002)



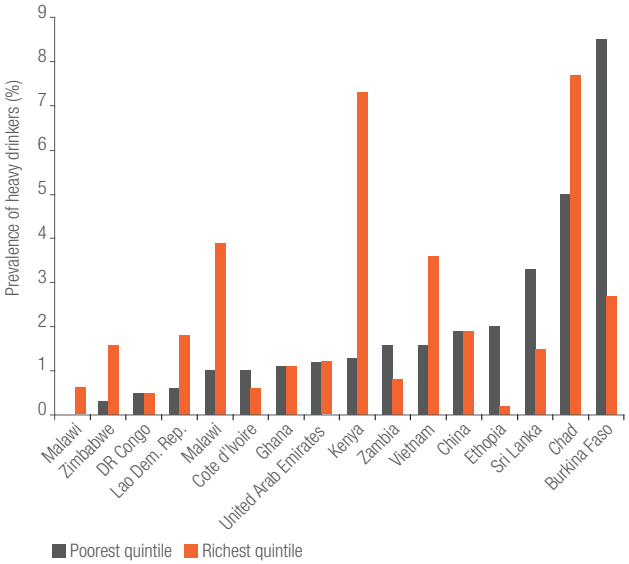
Source WHO World Health Statistics 2006 (www.who.int/whosis/whostat2006/en/index.html; accessed 16 September 2006)
Note The sample comprises 70 countries and the robust regression results are: Female smoking = 4.7 + 1.22 GDPpc - 0.024 $(GDPpc)^2$ (R^2=0.24). The coefficients are statistically significant at the 1% level. In adolescents, data relate to daily or occasional tobacco use, while in adults they relate to daily or occasional tobacco smoking. Comparisons between countries may be limited due to differences in definitions, sample characteristics or survey years.

Figure A 8 Annual alcohol consumption per person (age > 14) versus gross domestic product (GDP) per person (2002)



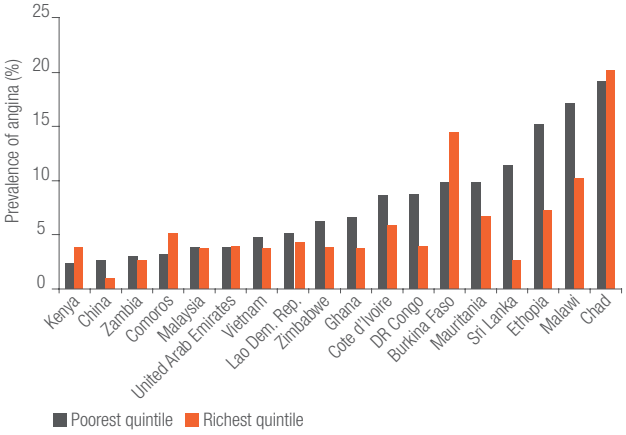
Source WHO Global Alcohol Database (www3.who.int/whosis/menu.cfm?path=whosis,topics,alcohol&language=english; accessed 3 August 2006)
Note The sample comprises 161 countries and the robust regression results are: Alcohol consumption per person = 2.3 + 0.43 GDPpc - 0.0054 $(GDPpc)^2$ (R^2=0.35). The coefficients are statistically significant at the 1% level. It is important to note that the above alcohol consumption data comprise in most cases only the recorded alcohol consumption; actual levels may be much higher.

Figure A 9 Prevalence of frequent heavy drinkers (age > 17) in the poorest and richest income quintiles in selected low- and middle-income countries (2002)



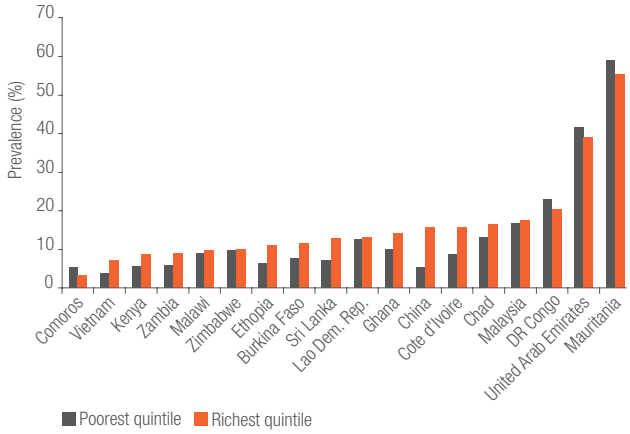
Source WHO World Health Survey (www.who.int/healthinfo/survey/en; accessed 20 July 2006)
Note Countries are ordered by the size of drinking prevalence in the poorest quintile. Frequent heavy drinkers are defined as those who have had five or more standard drinks per day in three or more of the last seven days.

Figure A 10 Prevalence of diagnosed angina (age > 17) in the poorest and richest income quintiles in selected low- and middle-income countries (2002)



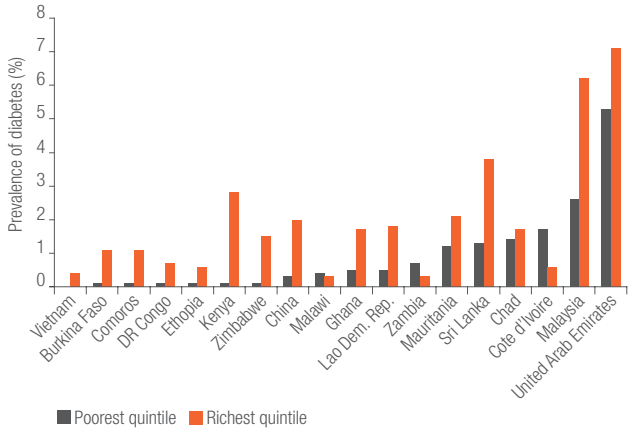
Source WHO World Health Survey (www.who.int/healthinfo/survey/en; accessed 20 July 2006)
Note Countries are ordered by the size of diagnosed angina prevalence in the poorest quintile. The percentage expresses the share of respondents diagnosed in the 12 months prior to the survey.

Figure A 11 Prevalence of insufficient physical activity (age > 17) in the poorest and richest income quintiles in selected low- and middle-income countries (2002)



Source WHO World Health Survey (www.who.int/healthinfo/survey/en; accessed 20 July 2006)
Note Countries are ordered by the size of insufficient physical activity prevalence in the poorest quintile. Insufficient physical activity is defined as less than 150 minutes per week spent on walking, moderate activity or vigorous activity.

Figure A 12 Prevalence of diabetes (age > 17) in the poorest and richest income quintiles in selected low- and middle-income countries (2002)



Source WHO World Health Survey (www.who.int/healthinfo/survey/en; accessed 20 July 2006)
Note Countries are ordered by the size of diagnosed diabetes prevalence in the poorest quintile. The percentage expresses the share of respondents diagnosed in the 12 months prior to the survey.

Tables

Table A 1 Projections of cause-specific disability-adjusted life years (DALYs) as a percentage of total DALYs in middle- and high-income countries, baseline scenario

		2005	2015	2030
HIGH INCOME	Communicable, maternal, perinatal and nutritional conditions	6%	4%	3%
	Chronic or non-communicable conditions	86%	88%	89%
	Injuries	9%	8%	7%
UPPER-MIDDLE INCOME	Communicable, maternal, perinatal and nutritional conditions	17%	13%	11%
	Chronic or non-communicable conditions	68%	72%	75%
	Injuries	15%	15%	14%
LOWER-MIDDLE INCOME	Communicable, maternal, perinatal and nutritional conditions	21%	18%	16%
	Chronic or non-communicable conditions	64%	67%	71%
	Injuries	15%	14%	13%

Source Mathers and Loncar (2005)

Table A 2 Out of all cause-specific deaths, what share occurs before age 70?

	Low income	Lower-middle income	Upper-middle income	High income
Communicable, maternal, perinatal and nutritional conditions	93%	85%	75%	26%
Chronic or non-communicable conditions	57%	45%	46%	28%
Injuries	91%	89%	89%	58%

Source Mathers et al. (2003)

Table A 3 Out of all cause-specific disability-adjusted life years (DALYs), what share occurs before age 70?

	Low income	Lower-middle income	Upper-middle income	High income
Communicable, maternal, perinatal and nutritional conditions	99%	98%	97%	85%
Chronic or non-communicable conditions	91%	86%	88%	77%
Injuries	99%	98%	99%	94%

Source Mathers et al. (2003)

Table A 4 Out of all deaths before age 70, how many are accounted for by each disease category?

	Low income	Lower-middle income	Upper-middle income	High income
Communicable, maternal, perinatal and nutritional conditions	61%	24%	20%	6%
Chronic or non-communicable conditions	29%	59%	64%	81%
Injuries	10%	17%	16%	13%

Source Mathers et al. (2003)

Table A 5 Out of all disability-adjusted life years (DALYs) lost before age 60, how many are accounted for by each disease category?

	Low income	Lower-middle income	Upper-middle income	High income
Communicable, maternal, perinatal and nutritional conditions	60%	27%	21%	7%
Chronic or non-communicable conditions	28%	54%	62%	80%
Injuries	12%	18%	17%	13%

Source Mathers et al. (2003)

Table A 6 Out of all disability-adjusted life years (DALYs) lost before age 70, how many are accounted for by each disease category?

	Low income	Lower-middle income	Upper-middle income	High income
Communicable, maternal, perinatal and nutritional conditions	58%	25%	19%	7%
Chronic or non-communicable conditions	31%	59%	65%	82%
Injuries	11%	17%	16%	11%

Source Mathers et al. (2003)

Table A 7 Total costs and indirect costs of chronic disease, measured by various cost-of-illness (COI) studies

Country, year of data collection	Total costs (% of GDP)	Indirect costs (% of total costs)
CHRONIC DISEASE, ALL TYPES		
United States, 2002-04[1]	6.8	N/A
CARDIOVASCULAR DISEASE		
Australia, 1996[2]	4.1	94
Austria, 2003	1.9	37
Belgium, 2003	1.7	39
Canada, 1998[3]	2.6	63
Cyprus, 2003	1.3	55
Czech Republic, 2003	2.7	39
Denmark, 2003	1.6	48
Estonia, 2003	2.6	48
Finland, 2003	2.4	53
France, 2003	1.6	35
Germany, 2003	3.3	35
Greece, 2003	2.2	35
Hungary, 2003	2.1	43
Ireland, 2003	0.9	51
Italy, 2003	1.8	31
Latvia, 2003	1.7	60
Lithuania, 2003	2.1	41
Luxembourg, 2003	1.1	39
Malta, 2003	0.5	45
Netherlands, 2003	2.2	37
Poland, 2003	2.5	53
Portugal, 2003	1.9	45
Slovakia, 2003	2.2	35
Slovenia, 2003	1.5	42
Spain, 2003	1.4	43
Sweden, 2003	2.3	42
United Kingdom, 1999[4]	1.0	76
United Kingdom, 2003	2.9	42
United States, 2004[1]	3.8	39

Country, year of data collection	Total costs (% of GDP)	Indirect costs (% of total costs)
STROKE		
Austria, 2003	0.4	57
Belgium, 2003	0.4	57
Cyprus, 2003	0.5	82
Czech Republic, 2003	0.5	58
Denmark, 2003	1.7	58
Estonia, 2003	0.7	67
Finland, 2003	0.6	71
France, 2003	0.3	53
Germany, 2003	0.9	44
Greece, 2003	0.5	67
Hungary, 2003	0.5	64
Ireland, 2003	0.3	65
Italy, 2003	0.3	50
Latvia, 2003	0.7	70
Lithuania, 2003	0.6	54
Luxembourg, 2003	0.2	70
Malta, 2003	0.1	77
Netherlands, 2003	0.7	44
Poland, 2003	0.7	75
Portugal, 2003	0.4	61
Slovakia, 2003	0.5	58
Slovenia, 2003	0.3	60
Spain, 2003	0.3	62
Sweden, 2003	0.6	61
United Kingdom, 2003	0.9	51
United States, 2004[5]	0.4	38

Note All data comes from British Heart Foundation (2005), unless otherwise noted.
This summary of literature is not meant to be exhaustive, but to provide useful examples. GDP = gross domestic product, N/A = not available.
GDP = gross domestic product, N/A = not available.
Sources [1]AHA 2005, [2]CDHA, 2003, [3]Public Health Agency of Canada 2002, [4]Liu et al. 2002, [5]AHA 2004, [6]Barcelo et al. 2003, [7]Villearreal-Rios et al. 2002, [8]Hogan et al. 2003, [9]Chale et al. 199

Table A 7 (continued)

Country, year of data collection	Total costs (% of GDP)	Indirect costs (% of total costs)
DIABETES		
Argentina, 2000[6]	3.9	93
Bahamas, 2000[6]	3.1	93
Barbados, 2000[6]	5.9	92
Bolivia, 2000[6]	2.7	62
Brazil, 2000[6]	3.8	83
Canada, 1998[3]	0.2	77
Chile, 2000[6]	3.2	88
Colombia, 2000[6]	3.1	84
Costa Rica, 2000[6]	3.0	80
Dominican Republic, 2000[6]	3.2	64
Ecuador, 2000[6]	3.8	61
El Salvador, 2000[6]	3.8	72
Guatemala, 2000[6]	4.4	65
Guyana, 2000[6]	5.1	44
Haiti, 2000[6]	2.0	39
Honduras, 2000[6]	4.0	53
Jamaica, 2000[6]	5.2	67
Mexico, 1995[7]	0.8	N/A
Mexico, 2000[6]	2.6	87
Nicaragua, 2000[6]	3.3	34
Panama, 2000[6]	3.7	76
Paraguay, 2000[6]	2.8	67
Peru, 2000[6]	3.5	73
Trinidad/Tobago, 2000[6]	3.5	87
United States, 2002[8]	1.3	31
Uruguay, 2000[6]	3.9	88
Venezuela, 2000[6]	1.8	88
Tanzania, 1992[9]	0.5	N/A
HYPERTENSION		
Mexico, 1999[7]	0.7	N/A
United States, 2004[5]	0.4	26

Table A 8 Total costs and indirect costs of chronic disease risk factors, measured by various cost-of-illness (COI) studies

Country, year of data collection	Total costs (% of GDP)	Indirect costs (% of total costs)
TOBACCO USE		
Australia, 1992 (Collins and Lapsley 1996)	3.4	49
Canada, 1991 and 1992 (Kaiserman 1997 and Xie et al. 1996)	1.4–2.2	N/A
China, 1989 (Hu and Mao 2002)	1.5	74
France, 1997 (Fenoglio et al. 2003)	1.1	50
Finland, 1995 (Pekurinen 1999)	0.8	N/A
Hungary, 2002 (Szilagyi 2004)	3.2–4.0	N/A
India, 1990–1991 (Rath and Chaudry 1995)	0.0	N/A
Myanmar, 1999 (Kyaing 2003)	0.1	N/A
Puerto Rico, 1997 (Jha and Chaloupka 2000)	0.4	N/A
Peru, 1997 (Jha and Chaloupka 2000)	0.8	N/A
South Korea, 1993–1998 (Kang et al. 2003)	0.6–1.2	N/A
Taiwan, 2001 (Yang et al. 2005)	0.5	78
United States, 1997–2001 (CDC 2005)	1.7	55
Venezuela, 1997 (Pan American Sanitary Bureau 1998)	0.3	N/A
OBESITY		
Canada, 2001 (Katzmarzyk and Janssen 2004)	0.7	70
China, 1995 (Popkin 2001)	2.1	24
Germany, 1998 (Sander and Bergemann 2003)	0.2	48
India, 1995 (Popkin et al. 2001)	1.1	67
Switzerland, 2002 (Schmid et al. 2005)	0.6	N/A
United States, 2000 (US Department of Health and Human Services 2001)	1.2	48
Germany, 1995 (Horch and Bergemann 2003)	1.1	N/A
France, 1997 (Fenoglio et al. 2003)	1.4	57
Switzerland, 2001 (Frei et al. 2001)	0.1	N/A
DEPRESSION		
United States, 2000 (Greenberg et al. 2003)	0.9	69

Note This summary of literature is not meant to be exhaustive, but to provide useful examples. GDP = gross domestic product, N/A = not available.

Table A 9 The impact of chronic disease and risk factors on labour supply

Country and study	Year data collected	Chronic condition and impact of chronic condition on employment indicators/labour supply
Canada Kraut et al. 2001	1983–1990	**Diabetes** People 2.1-fold less likely to work
Europe Jimenez-Martin et al. 1999	1994–1995	**Chronic disease** Chronic disease increases the retirement probability Husband's health affects the couple's retirement decisions much more strongly than the wife's health does
Finland Sarlio-Lahteenkorva and Lahelma 1999	1994	**Obesity** Women face a 2.5-fold higher likelihood of unemployment Women face a 1.4-fold higher likelihood of unemployment
Ireland Gannon and Nolan 2004	2000	**Chronic disease** Men 61% less likely to work; women 52% less likely to work
	2002	**Chronic disease** Men 66% less likely to work; women 42% less likely to work
Russia Suhrcke et al. 2005	2002	**Chronic disease** Retirement age decreases by 2.5 years Men have a 13.6% greater chance of retirement Women have a 14.0% greater chance of retirement
Sweden Lindholm et al. 2001	1979–1997	**Chronic disease** Unemployment 1.9-fold higher 2.5-fold increase in people on welfare 1.8-fold increase in people with financial difficulties 3.5-fold increase in economic inactivity
United States Serxner et al. 2001	1990–1998	**Mental health** Absenteeism is 47% higher
		Tobacco use Absenteeism is 19% higher
		Obesity Absenteeism is 23% higher
United States Simon et al. 2000	N/A	**Depression** 15.3% higher employment rate for depression remission vs. control group
United States Dwyer and Mitchell 1999	1992	**Cardiovascular disease** Expected retirement age decreases by 0.7 years
		High blood pressure Expected retirement age decreases by 1.0 years
		Diabetes Expected retirement age decreases by 0.12 years
		Cancer Expected retirement age decreases by 0.13 years
United States Pelkowski and Berger 2004	1992–1993	**Chronic disease** Men work 6.1% fewer hours Women work 3.9% fewer hours
United States McGarry 2002	1992–1994	**Self-reported adult health** Men 3.5% less likely to work at age 62
United States Coile 2003	1992–2000	**Chronic disease** Men have a 42% greater probability of retirement and lose 1,030 hours of lifetime work Women have a 31% probability of retirement and lose 654 hours of lifetime work
United States Cawley 2004	1997–2004	**Obesity** For white people, a 10% weight increase corresponds to a 12% decrease in probability of full-time employment, 5.4% fewer hours worked, 5% fewer months, 16% increase in months on welfare, and 10% lower earnings For African Americans a 10% weight gain corresponds to a 10.9% increase in months spent on welfare

Note This summary of literature is not meant to be exhaustive, but to provide useful examples.

Table A 10 The impact of chronic disease and risk factors on wages, earnings or incomes

Country and study	Year data collected	Chronic condition and impact of chronic condition on employment indicators/labour supply
Australia Lee 1999	1980–1989	**Tobacco use** Wages are 6.6% lower for smokers and 5.5% lower for former smokers
Canada Kraut et al. 2001	1983–1990	**Diabetes** Wages decrease by 28%
Canada Auld 1998	1991	**Tobacco use** Daily smokers earn 30% less than nonsmokers.
Finland Sarlio-Lahteenkorva and Lahelma 1999	1994	**Obesity** Likelihood of low household income increases by 1.5 times Likelihood of low individual income increases by 1.6 times
Indonesia Kosen 1998	1995	**Tobacco use** Lost annual income is US$115 for individuals who use tobacco Lost annual income is also US$115 for family members of tobacco users
Netherlands van Ours 2004	2001	**Tobacco use** Wages 10% lower
Russia Suhrcke et al. 2005	2002	**Chronic disease** 5.6% lower median per-person income
United Kingdom Sargent and Blanchflower 1994	1974–1981	**Obesity** Wages reduced by 6.4% for 23-year-old women
United States Tucker and Friedman 1998	N/A	**Obesity** Likelihood of absenteeism increases 1.7-fold for men Likelihood of absenteeism increases 1.6-fold for women
United States Pronk et al. 2004	N/A	**Obesity** Obese employees are less likely to get along with co-workers and more likely to incur work loss days
		Physical activity Physical activity was positively associated with the quality of work performed and the overall job performance
		Cardiac fitness Cardio-respiratory fitness is positively associated with the quantity of work performed, and with extra effort exerted at work
United States Fielding 1996	N/A	**Physical inactivity** Productivity declined 50% in the last two hours of work each day
United States Sloan et al. 2004	N/A	**Tobacco use** Lifetime wages reduced by US$40,000
United States Gortmaker et al. 1993	1981–1988	**Obesity** Income for men is 9% lower (equivalent to a reduction of US$2,876) Income for women is 22% lower (US$6,710)
United States Cawley 2004	1981–2000	**Obesity** For white females, a difference in weight of two standard deviations (roughly 65 pounds) is associated with a difference in wages of 9% (in absolute value, this is equivalent to the wage effect of roughly one and a half years of education or three years of work experience)
United States Levine et al. 1997	1984–1992	**Tobacco use** Wages decrease by 4–8%
United States Zagorsky 2004	1985–2000	**Obesity** A one-point increase in body-mass index reduces net worth by US$1,000
United States Bhattacharya and Bundorf 2004	1989–1998	**Obesity** Wages reduced by US$0.71 per hour
United States Haskins and Ransford 1999	1988	**Obesity** Higher weight tends to lower the chances for women to enter higher professional or managerial positions
United States Ng et al. 2001	1989	**Diabetes** 33% reduction in wages (US$3,700–$8,700 per year)
United States Averett and Korenman 1999	1990	**Obesity** White women's wages are reduced by 17%
United States Pelkowski and Berger 2004	1992–1993	**Chronic disease** Men earn 5.6% less; women earn 8.9% less
United States Mitra 2001	1993	**Obesity** Women earn US$1.26 less per hour One-pound increase in weight is associated with 2% decrease in wages for women in professional/managerial positions
United States Berndt et al. 2000	1995	**Depression** 12–18% lower wages over lifetime
United States Haskins and Ransford 1999	1998	**Obesity** Higher weight tends to lower the chances for women to enter higher professional or managerial positions

Note This summary of literature is not meant to be exhaustive, but to provide useful examples.

Table A 11 Household impacts of chronic diseases and risk factors

Country and study	Year data collected	Chronic condition and impact of chronic condition on employment indicators/labour supply
Bangladesh Kibriya et al. 1999	N/A	**Diabetes** 6–12 months of wages lost, or $160 per year
Bangladesh Efroymson et al. 2001	1991–1996	**Tobacco use** Male smokers spent 18 times more money on cigarettes than health and 20 times more than on education Absence of household tobacco use corresponds to an increase of 500 calories to children's diet
China Hu et al. 2005	2002	**Tobacco use** Poor urban dwellers spend 6.6% of household income on cigarettes
Egypt Nassar 2003	1995–2000	**Tobacco use** 5–6% of household income spent on tobacco
India Shobhana et al. 2000	N/A	**Diabetes** 15–25% of household income necessary for treatment costs
India Bonu et al. 2004	1998–1999	**Tobacco use** Parent smoking is associated with lower likelihood of immunisation for children and higher likelihood of acute respiratory infection, malnourishment, and to death before age 1
Indonesia Adioetomo et al. 2005	1999	**Tobacco use** 6.2% of household income spent on tobacco
Morocco Aloui 2003	1998–1999	**Tobacco use** 2.4% of household income spent on tobacco 4.2-fold increase in tobacco use since 1959
Myanmar Kyaing 2003	1999	**Tobacco use** 2.7% of household income is spent on tobacco 4.4% of household income is spent on tobacco among households in the lowest income quintile
Nepal Karki et al. 2003	2001	**Tobacco use** Households in the lowest income quintile spent 9.62% of household income on tobacco products, compared with 5.11% in the richest income quintile
New Zealand Thomson et al. 2002	1988–1998	**Tobacco use** Enabling lower-income households to be tobacco-free would allow 14% of non-housing budget to be reallocated
Russia Suhrcke et al. 2005	1998–2002	**Chronic disease** Annual loss of 5.6% of per-person household income
Tanzania Neuhann et al. 2001	1996–1998	**Diabetes** Monthly care costs equal 25% of minimum wage; costs exceed per-person health expenditure by factor of 20
United States Case et al. 2002	1986–1995	**Mother's BMI** Negative impact on child health for children aged 0-17
		Household member smokes Negative impact on child health for children aged 0-17

Note This summary of literature is not meant to be exhaustive, but to provide useful examples.

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