Address to be used for correspondence:
Suzanne Butterworth
MRC National Survey of Health and Development
Department of Epidemiology and Public Health
Royal Free and University College London
1-19 Torrington Place
London WC1E 6BT

Is early motherhood a risk for later socioeconomic circumstances and health? Evidence from 2 British national longitudinal studies.

Suzanne L. Butterworth[1], Michael E. J. Wadsworth[1], Emily M. D. Grundy[2], Cecilia Tomassini[3]

[1] MRC National Survey of Health and Development, Department of Epidemiology and Public Health, Royal Free and University College London, 1-19 Torrington Place, London WC1E 6BT.

[2] Centre for Population Studies, London School of Hygiene and Tropical Medicine, 49-51 Bedford Square, London, WC1B 3DP

3 Population and Demography Division, Office for National Statistics, 1 Drummond Gate, London, SW1V 2QQ

Running head: Is early motherhood a health and social risk?

Abstract

This paper contributes to the debate about the impact of early motherhood on women's later life health. Two British nationally representative longitudinal studies are used to examine associations between early childbearing and mid-life health, and investigate whether these are still apparent after allowance for antecedent characteristics of early mothers and/or subsequent socioeconomic differentials. Both cohorts show that early motherhood is a raised risk for a socially disadvantaged later adult life. Neither physical nor mental health disadvantage were fully accounted for by factors associated with selection into early motherhood or by factors associated with adult socioeconomic circumstances, suggesting some potential long-term biological effect of early pregnancy.

Keywords: Longitudinal; Cohort; Fertility; Socioeconomic; Mental health; Physical health; Age at first birth; Motherhood.

1. Introduction

Many national and international agencies, including the UK Department of Health, now have a policy objective of reducing teenage pregnancy and parenthood. The scientific grounds for this are the immediate higher risks to mother and baby and possible longer-term adverse socioeconomic consequences of early childbearing which again may affect both parent and child (Furstenberg et al 1987; Botting et al 1998; Wellings et al 1999; Hofferth and Reid 2002; van der Klis et al 2002).

Results from the British cohort studies indicate that teenage childbearing is associated with a range of negative events for women including higher risks of partnership breakdown, psychiatric morbidity and poorer housing conditions (Maughan and Lindelow 1997). Not only teenage childbearing, but also childbearing before the age of 23, has been found to be associated with negative outcomes, including poorer physical health at age 33 (Hobcraft and Kiernan 2001). Studies from other European countries and from the United States generally show a similar picture (Moore et al 1979; Olausson et al 2001). However the extent to which these associations can be regarded as causal remains controversial as it is so difficult to separate out the effects of early motherhood from the effects of socioeconomic conditions and personal characteristics that existed prior to the pregnancy, including unobserved variations in family background (Furstenberg et al 1987). Most studies have tried to control for antecedent factors using retrospective data and have found that observed associations between early childbearing and poorer life circumstances later on persist, although less strongly (Hoffman et al 1993; Hoffman 1998). A similar difficulty complicates the investigation of possible longer term health consequences of reproductive history, including early childbearing, because socioeconomic, psychological and family circumstances in childhood and young adulthood are strongly associated with both fertility patterns and with health and mortality (Maughan and Lindelow 1997, our paper?).

The antecedent characteristics of women who start childbearing early in life and the possibly diminished life chances which early motherhood may bring, would themselves suggest a probable association between early motherhood and health in later life. Additionally there may be a more direct relationship between early motherhood and later health if the physiological and psychological stresses of pregnancy, childbirth and childrearing are greater for young mothers.

Pregnancy and childbirth are important physiological and emotional events, and for more than 40 years research has suggested links between reproductive history and subsequent health (Pyke 1956; Winkelstein et al 1958, 1964; Doblhammer 2000). There are well-established links between aspects of fertility and certain diseases, most notably breast cancer, which has been shown to be associated with nulliparity and delayed motherhood (Beral 1978; Leon 1989; Kvale et al 1994). There is also growing evidence of associations between reproductive histories and a range of later life chronic diseases. However, it is unclear whether reproductive characteristics are risk factors for chronic diseases in their own right or whether they 'merely reflect earlier exposures in childhood and adolescence that are the direct determinants of chronic disease' (Rich-Edwards 2002).

Several studies have reported associations between early childbearing and ill health or mortality in mid and later life. Doblhammer (2000) in analyses based on the Office for National Statistics Longitudinal Study (ONS LS) found that ever married women who had given birth before age 20 had a higher mortality risk at ages 50-85. Grundy and Holt (2000) used data from the British Retirement Surveys to investigate life history effects on self-rated health and disability at ages 55-75 and worse outcomes were associated with childbearing before age 23. Kington et al (1997) reported an association between teenage childbearing and health after the age of 50 in a longitudinal study of US women. However all of these studies were limited in some ways. Dobblehammer, for example, restricted her analyses to ever-married women and controlled only for higher level educational qualifications, a poor discriminator in current cohorts of older women. Grundy and Holt, and Kington et al analysed relatively small samples and considered their results in need of confirmation in other data sets. It should also be noted that some studies of particular population groups, namely African-American women in poor neighbourhoods, have found quite different effects with higher mortality after age 55 among those who deferred motherhood until 25 or later (Aston et al 2002).

In Britain the cohorts with high rates of early childbearing are now reaching the ages at which incidence of long term health problems increases (table 1). Until the Second World War fertility rates among 15-19 year olds were considerably lower than those of women in all other reproductive age groups, including women aged 40-45. However between 1941 and 1971 teenage age specific fertility rates increased from 15 per 1,000 to 51 per 1,000 and by the late 1960s were not only higher than those of

women in their forties, but also exceeded those of women aged 35-39 (Werner 1987). By 1975 teenage birth rates had fallen back to the 1955 level and since then have fluctuated around 30 live births per 1000 women aged 15-19 – considerably lower than the 1971 peak but still much higher than those of any other European Union country and about twice the level of those in pre W.W.II 20th century England and Wales (Werner 1987; ONS 2001). This means that it is important to see whether, and if so why, early motherhood and mid life health are associated.

Three possible reasons for such an association are developed in this analysis. First, any such association may be wholly or partly due to selection factors, that is antecedent childhood characteristics associated both with early childbearing and subsequent life chances, health related behaviour and health status. Second, early childbearing may influence health status in mid life indirectly through the effect of early motherhood on adult socioeconomic circumstances. Finally, there may be direct effects if young mothers are physiologically or psychologically more vulnerable to the stresses of pregnancy, childbirth and childrearing.

In this paper we use data from two British nationally representative longitudinal studies to examine associations between early childbearing and mid life health, and investigate whether these are still apparent after allowance for antecedent characteristics of early mothers and/or subsequent socioeconomic differentials. The primary data set used is the MRC National Survey of Health and Development (NSHD), a national birth cohort study of those born in 1946. We compare results from this with those from the Office for National Statistics Longitudinal Study (ONS LS). Whilst the ONS LS lacks data on prior circumstances of early mothers and much of the detail on health included in the NSHD, it has the advantage of much larger sample size and is multi cohort.

2. Participants and Methods

2.1 The MRC National Survey of Health and Development

The MRC National Survey of Health and Development is a social class stratified sample of the single, legitimate births that occurred in the week 3-9 March 1946 in England, Wales, and Scotland (N=5,362). There were 10 follow up contacts in infancy and childhood and ten contacts so far in adult life, up to age 53 years. Losses by that age occurred through death (9%), permanent refusals (12 %) and residence abroad (8%). At the last contact in 1999, 83 per cent (N=3,035) of the resident target

population were measured and interviewed. A more detailed summary of the survey and its representativeness is published elsewhere (Wadsworth et al, 2003).

2.2 Measurements in the NSHD

(a) Timing of first birth. Data on study members' fertility histories were collected at all adult sweeps and were used to determine whether, and at what age, women had given birth. On the basis of the distribution of age at first motherhood in the cohort we classified women as 'early mothers' if they reported their first live birth before or at age 20 (25%) against all other births from 21 years of age onwards (75%). Non-parous women were excluded from this study.

(b) *Childhood circumstances.* Birth order (1st born v later), birthweight (kg), height at 7 years (cm), age at menarche, and serious illness in childhood (hospital in-patient stay accumulating 3 months or more in any year, up to age 15, or more than one month consecutively) were all recorded during health visitors home visits in childhood and at medical examinations carried out for the study by school doctors. The child's teacher assessed parental interest in education at both primary and secondary level, and parents reported membership of the school parent-teachers association and discussions with teachers: a score (0-50) was derived from these sources.

Health visitors collected socioeconomic information from interviews of the mother at home when the survey members were 4 years of age. Indicators used in this analysis were father's social class (manual or non-manual), home ownership (yes or no), overcrowding (more than 1 person per room), and a score derived from health visitor reports on the care of the child.

(c) Adult social circumstances. Adult socioeconomic status was based on the Registrar General's social class classification derived from the current or last occupation of the survey member. Information on current marital status, home ownership, employment status, educational attainment and parity was collected at 36, 43 and 53 years. Here we have used these data to classify sample members according to whether they were homeowners at none, one, two or all of these time points. A cumulative index of employment was derived in the same way.

(d) Mortality, morbidity, and health related behaviours. Since 1972 (age 26 years) study members have been flagged for death notification on the National Health Service Central Register. Previous to this the study relied on the families' reports.

In 1999 (age 53 years) research nurses at home visits gave study members a list of 22 medical conditions and asked whether or not they had suffered from any in the last ten years (e.g. *In the last ten years (that is since you were 43 years old) have you had diabetes?*). An overall burden of illness variable was generated by summing the number of conditions reported and grouping those who had experienced 3 or more into a high risk category. Further summary variables of major illness groups (chest pain, respiratory illness, cancer) were also derived. Information on psychiatric morbidity was taken from the Psychiatric Symptom Frequency Inventory at 43 years (Lindelow et al 1997; Pakel et al 2001), and three measures were used. These were reports of suicidal ideation and of trouble with nerves, and the scale was divided to indicate the clinical definition of depression.

Survey members were asked at the home visit at 53 years about the frequency and duration of physical activity during leisure time in the last month. The results were used to make three discrete categories: Inactive (no reported periods in the last month), mildly active (1-4 periods a month) or active (more than 4 periods a month). Height and weight were measured by nurses at the home visit at 53 years and used to calculate body mass index (kg/m^2). Smoking histories (current smoker, ex-smoker and non-smoker) were founded on responses to questions regarding personal smoking habits at ages 26, 36, 43 and 53 years. A potential alcohol problem was defined by positive responses to the CAGE screening questions given as a self-completion questionnaire at the home visit data collection at age 43 years (Ewing 1984).

2.3 The ONS Longitudinal Study

Comparisons are made with the ONS Longitudinal Study (LS), a record linkage study of 1 per cent of the population initially based on those enumerated in the 1971 Census of England and Wales (approximately 500,000 people) (Hattersley and Creeser 1995). Information on births to, and deaths of, LS sample members has been added to the dataset through linkage via the National Health Services Central Register (currently complete to the end of 2000), as this provides individual level information from the 1981 and 1991 census records of LS members.

This analysis uses data on women born 1944-48. This sample comprises 18,772 women present in the 1971 Census and traced in the National Health Services Central Register excluding those known to have emigrated by 2000 (826), a further 1,306 lost to follow up (many of whom would also be emigrants) and those with discrepant ages or dates, leaving a sample of 17,297.

2.4 ONS LS measures

(a) Timing of first birth. Data on fertility come from a combination of fertility history information collected in the 1971 Census and linkage of data from records of births to sample mothers. The 1971 Census collected fertility histories from ever-married women then aged 16-59 who were asked only about legitimate births. This means that we lack information on non-marital births prior to 1971. Levels of non-marital fertility were then relatively low (about 7-8 per cent of all births between 1944 and 1948, ONS Births Series 2002) but as there is an association between early childbearing and non-marital births, this omission means we will have failed to identify some early mothers. Subsequent linkage of births includes all births, both marital and non-marital, linkage rates are estimated to be around 91-92 per cent (Hattersley and Creeser 1995).

(b) Adult social circumstances. Information on adult socio-demographic and socioeconomic circumstances has been drawn from characteristics recorded in the 1971 and 1991 Censuses including marital status, housing tenure and access to a car in 1971 and 1991, and Registrar General's social class, employment status and parity in 1991. Educational level in 1991 was also obtained, but the 1991 Census only asked about qualifications equivalent to or higher than A-level (examination taken at around age 18) (Emily is this correct? Isn't it 1971?), so we cannot distinguish between women with lower level qualifications and those with none. Information on childhood circumstances is not available.

(c) Morbidity and mortality. The 1991 Census included a question on long-standing illness and we use this here as an indicator of health status at ages 43-47. Additionally we use the linked mortality data to analyse mortality risks between the ages of 35 and 53-57 years by age of first birth.

3. Analysis

Our analysis strategy was first to examine associations between early motherhood and mid-life health; second to see if these persisted when childhood circumstances were allowed for (only in the NSHD); and third to investigate effects once adult socioeconomic circumstances were also allowed for. As we hypothesised that influences on health might be the result of effects on health related behaviours, we controlled for health related behaviours in some models of mid-life health. Finally mortality was examined amongst early mothers using Cox proportional hazard models.

3.1 Analysis of the 1946 birth cohort data

We first describe the distribution of the 2 groups of women (early first birth against all other parous women) in relation to childhood circumstances, and then in relation to their health and social circumstances in adulthood. Chi-square tests were used to examine the associations between timing of motherhood and early life factors, and logistic regression analysis tested the strength of any associations found after adjustment for fathers social class. Those that remained significantly ($p<0.05$) associated with the outcome were included in later analyses.

Second, we examined the outcome in relation to burden of ill health and 4 specific self reported physical illnesses at 53 years using logistic regression analysis. Unadjusted analysis was carried out on the full available sample for each outcome. Adjustments were made, separately, for early life developmental and socioeconomic factors, adult socioeconomic factors and health behaviours, and then full adjustment. Associations with mental health problems were examined in the same way. Multivariate analysis was carried out on a restricted population which included cohort members who had data on all factors available (n=618).

Third mortality risk amongst early mothers compared to all other parous women was assessed. All available sample members were used in this analysis (n=1783, events=312). Cox's proportional hazard models were used to estimate unadjusted hazard ratios. Follow-up time was in months since birth until death. Follow-up was treated as censored if the event was other than death among parous women.

3.2 Comparison of the 1946 birth cohort results with the ONS LS

We use LS data first to provide comparative information on timing of childbearing for cohorts born in the first half of the twentieth century, which provides a context for the rest of the analyses. These data are available only for those women still alive in 1971. Second, we analysed risks of longstanding illness at ages 43-47 (in 1991) for the two groups of women using logistic regression and adjusting for adult socio-demographic and socioeconomic circumstances. We also took advantage of the much larger size of the LS sample to analyse risks of death during the period 1992-2000 in relation to timing of first birth, adjusting for circumstances in 1971 and 1991.

4. Results

4.1 Cohort fertility comparisons

Table 1 shows the distribution of the 1911-20 to 1944-48 birth cohorts of women included in the LS by age at birth of first child together with comparable data for the 1946 NSHD. The table illustrates the pronounced changes in timing of first motherhood that occurred during the first half of the twentieth century. Only 9 per cent of women born 1911-20 had a child before the age of 21 compared with 21 per cent of women born 1931-40, while the proportion with a first birth after the age of 21 fell from 91 to 79 per cent. In the 1944-48 LS cohort, 21 per cent of women had a child before 21 compared with the slightly higher figure of 25 per cent of the 1946 NSHD cohort. Sample differences may account for some element of these discrepancies: the LS includes only England and Wales while the NSHD is a class stratified British sample, and for the LS analyses we include those born 1944-48 rather than just those born in 1946. However, as already described, the LS data excludes non-marital births prior to 1971 and for this reason underestimates early childbearing.

Results from the NSHD may have been influenced by the fact that the sample includes only women who were legitimately born and by the greater loss to adult follow-up in the early motherhood group compared with others; only 70 per cent of early mothers remained in the study at 53 years, compared to 79 per cent of other parous women. In the LS some early mothers are also missed or misclassified as non-marital births before 1971, and not captured in the data. In consequence our results may underestimate the effects described.

4.2 Health and social circumstances before the first birth in the NSHD cohort

Women who were second or later born, and women who were shorter than others at age 7 years were more likely to have an early first birth (table 2a). Early mothers were

more likely than other parous women to have had an episode of chronic illness before age 15 years, to have a father in manual employment, and have parents with low educational attainment (table 2a). Parental interest in the study child's education at both primary and secondary school was lower in those who experienced an early first birth compared with others (table 2a). These associations remained significant after adjustment for father's social class.

4.3 Social and family circumstances after age 15 years in both cohorts

In comparison with other mothers, those who had an early first birth acheived lower educational attainment (table 2b). By age 53 years they were more inclined to be in manual social class employment, to have reduced likelihood of home ownership, to have married more than once and have had more children compared with others (table 2b). Age at first motherhood remained significantly associated with number of marriages, parity, own social class at 53 years, and educational attainment again after taking account of father's social class.

Analysis using LS data also found that early mothers were more likely to be in manual social class employment, have lower home and car ownership, and a lower level of education (table 3).

4.4 Morbidity in mid life in both cohorts

Comparison of health status at 53 years shows that women who experienced an early first birth reported significantly more chest pain, respiratory illness and clinical depression; sucidal ideation was approaching significance (table 4). There were however no differences in the number of medical consultations nor in reports of cancers (table 4). In the restricted population of study members for whom data was avialable on all covariants, unadjusted analysis showed suicidal ideation to not be significant ($p=0.31$) whilst chest pain, respiratory illness and clinical depression remained (table 5 model 1). Chest pain, respiratory illness and caseness were robust to adjustment, separately, for childhood developmental and socioeconomic factors (table 5 model 2), for adult socioeconomic factors (table 5 model 3), for adult health behaviours (table 5 model 4) and finally full adjustment (table 5 model 5).

Analysis of LS data found a significant association between early motherhood and increased risk of long term illness at ages 43-47 (1991) after controlling for parity and socioeconomic indicators. For women having a child before age 21 the odd ratio to

report the presence of long term illness was 1.55 (CI 1.32-1.83). A FIGURE DOESN'T MAKE ANY SENSE NOW, EITHER WE LEAVE JUST THE SENTENCE OR WE INCLUDE THE TABLE WITH ALL THE RESULTS FROM THE LOGISTIC REGRESSION. WHAT DO YOU THINK?

4.5 Mortality in both cohorts

A relative risk analysis of age at death in the 4 groups of NSHD women, revealed a significantly higher risk of death in early mothers compared to all other parous women (RR=1.52 (95% CI= 1.20, 1.92) p <0.001) (not shown).

Analysis of LS mortality data, restricted to parous women, supported NSHD findings ??? reporting no significant difference between the reference norm group and early mothers WHEN A DISCRETE TIME SURVIVAL ANALYSIS HAS BEEN PERFORMED FOR THE PROBABILITY TO DIE AFTER AGE 35 9I need to check this).

5. Discussion and conclusions

We compared health and socioeconomic risks associated with timing of entry into motherhood using data from 2 national longitudinal studies. We asked whether findings from earlier studies showing increased health and socioeconomic adversity among early mothers (Kington 1997; Grundy and Holt 2000; Maughan and Lindelow 1997) could be replicated, and whether they could be accounted for by selection effects.

Data from the ONS LS showed that for women born between 1944 and 1948 early motherhood, in comparison with all other mothers, was associated with a significantly reduced chance of high educational attainment, of home ownership or of access to a car in the household. Early motherhood was significantly associated with a greater number of births overall and with greater risk of long-term illness at ages 43-47. Among parous women though, those who had a early first birth had not a significantly higher risk to die.

Data from a national birth cohort study sample born in 1946 (the NSHD) showed early motherhood to be associated with biological and social disadvantage in the pre-school and school years, in comparison with other parous women, even after controlling for father's social class. In mid adulthood early mothers differed from other parous women in having a greater risk of no qualifications, of being in a manual

social class, having mulitple marriages and more children, with a lower likelihood of continuous home ownership over the previous 17 years. All of these associations were associated with age at first birth even after adjustment for the effects of pre-school and school years' factors.

Early mothers also differed from other parous women in mid-adult health. They were shown to be at greater risk of chest pain, respiratory illness, and clinical depression. On full adjustment for pre- and post motherhood data, the association between early motherhood and chest pain, respiratory illness and depression remained significant.

There is agreement between our 2 studies that early motherhood is a raised risk for a socially disadvantaged later adult life. The life course analyses show that almost all social and economic aspects of such disadvantage were associated with age at first birth, even after taking account of the effects of risk factors from the period before the first birth. Neither physical nor mental health disadvantage were fully accounted for by factors associated with selection into early motherhood or by factors associated with adult socioeconomic circumstances. Differences between the 2 studies in findings on mortality are probably the result of the small numbers of deaths in each of the 4 groups of women in the NSHD.

These findings are likely to be specific to women born in the period 1944-48. In later born British cohorts, risk of early motherhood was influenced, and probably differentially in relation to father's social class and own education, by the easier availability of modern methods of contraception and of abortion, following the Abortion Law Reform Act of 1967. As noted earlier teenage fertility rates are now lower than in the late 1960s and one effect of this is that those becoming teenage mothers in subsequent cohorts may represent a group even more strongly selected for vulnerabilities such as socioeconomic disadvantage, poor educational attainment and experience of family disruption (Maughan and Lindelow 1997). Another very important difference is that in the 1946 cohort 82 per cent of those who became mothers before the age of 21 (and 81% of teenage mothers) were married, whereas more recently close to 90 per cent of teenage mothers have been *unmarried* (ONS 2001). In later cohorts the protective effect of educational attainment will be greater because of the increase in years of education experienced (Halsey and Webb 2000), but this may mean that curtailment of education due to early motherhood becomes an increased risk factor, as employment chances come to vary even more by educational status.

Future studies of the 1946 birth cohort (NSHD), as the sample ages, should continue to investigate the long-term possible sequelae of early motherhood, not only in terms of mental and physical health, socioeconomic circumstances and mortality, but also in terms of family relations and care.

References

Aston, Nan Marie, Margaret Ensminger and Hee Soon Juan. 2002. Early adult characteristics and mortality among inner city African American women. *American Journal of Public Health* 92: 640-645.

Beral, V., P. Fraser, and C. Chilvers. 1978. Does pregnancy protect against ovarian cancer? *Lancet* 20; 1(8073): 1083-7.

Botting, Beverley, Michael Rosato and Rebecca Wood. 1998. Teenage mothers and the health of their children. *Population Trends* 93:19-28.

Doblhammer, Gabriele. 2000. Reproductive history and mortality later in life: A comparative study of England and Wales and Austria. *Population Studies* 54: 169-176.

Ewing, J.A. 1984. Detecting alcholism, the CAGE questionnaire. *Journal of the American Medical Association* 252: 1904-1907.

Furstenberg, Frank F., J. Brooks-Gunn, and S.P. Morgan. 1987. *Adolescent mothers in later life*. Cambridge University Press.

Grundy, Emily and Gemma Holt. 2000. Adult life experiences and health in early old age in Great Britain. *Social Science and Medicine* 51: 1061-1074.

Halsey, A.H. and J. Webb. (eds.) 2000. *Twentieth Century British Social Trends*, Macmillan, London.

Hattersley, L., and R. Creeser. 1995. *Longitudinal Study 1971-1991 History, organisation and quality of data*. London: HMSO.

Hobcraft, John and Kathleen Kiernan. 2001. Childhood poverty, early motherhood and adult social exclusion. *British Jounal of Sociology* 52: 495-517.

Hofferth, S.L and L. Reid. 2002. Early childbearing and children's achievement and behavior over time. *Perspectives in Sexual Reproductive Health* 34: 41-9.

Hoffman, Saul D. 1998. Teenage childbearing is not so bad after all…or is it? A review of the new literature. *Family Planning Perspectives* 30: 236-9.

Hoffman, Saul D, E Michael Foster, and Frank F. Furstenberg. 1993. Reevaluating the costs of teenage childbearing. *Demography* 30: 1-13.

Kington, Raynard, Lee Lillard and Jeannette Rogowski. 1997. Reproductive history, socio-economic status, and self-reported health status of women aged 50 years or older. *American Journal of Public Health* 87(1): 33-37.

Kvale, G., I. Heuch, and S. Nilssen. 1994. Parity in relation to mortality and cancer incidence: a prospective study of Norweigen women. *International Journal of Epidemiology* 23(4): 691-9.

Leon, D.A. 1989. A prospective study of the independent effects of parity and age at first birth on breast cancer incidence in England and Wales. *International Journal of Cancer* 43(6): 986-91.

Lindelow, Malin, Rebecca Hardy, and Bryan Rodgers. 1997. Development of a scale to measure symptoms of anxiety and depression in the general population: the Psychiatric Symptom Frequency (PSF) Scale. *Journal of Epidemiology and Community Health* 51: 549-557.

Maughan, Barbara, and Malin Lindelow. 1997. Secular change in psychosocial risks: the case of teenage motherhood. *Psychological Medicine* 27: 1129-1144.

Moore, K.A, Hofferth, S.L., and Wertheimer, R. 1979. Teenage motherhood: its social and economic costs. *Children Today* 8:12-6.

MRC Committee on the Aetiology of Chronic Bronchitis. 1960. Standardised questionnaires on respiratory symptoms. *British Medical Journal* 1665.

Office for National Statistics. 2001. *Social Trends 2001*. The Stationery Office, London.

Olausson, Petra, Bengt Haglund, Gunilla Ringback Weitoft, and Sven Cnattingius. 2001. Teenage childbearing and long-term socioeconomic consequences: a case study in Sweden. *Family Planning Perspectives* 33: 70-4.

Paykel, E.S., H. Hayhurst, R. Abbott, M.E.J. Wadsworth. 2001. Stability and change in milder psychiatric disorder over seven years in a birth cohort. *Psychological Medicine* 31: 1373-1384.

Pyke, DA. 1956. Parity and the incidence of diabetes. *Lancet* i: 818-821.

Rich-Edwards, Janet. 2002. A life couse approach to women's reproductive health. In Diana Kuh and Rebecca Hardy (eds) *A life course approach to women's health.* Oxford University Press.

Rose, G.A. 1982. *Cardiovascular survey methods; 2nd edition.* World Health Organisation, Geneva.

van de Klis, K.A., L. Westenberg, A. Chan, G. Dekker, and R.J. Keane. 2002. Teenage pregnancy: trends, characteristics and outcomes in South Australia and Australia. *Aust N Z Public Health* 26: 125-31

Wadsworth, Michael E. J., Suzanne L. Butterworth, Rebecca Hardy, Diana Kuh, Marcus Richards, Claudia Langenberg, Warren S. Hilder, and Marc Connor. 2003. The life course prospective design; an example of benefits and problems associated with study longevity. *Social, Science and Medicine* 57: 2193-2205.

Wellings, Kay, Jane Wadsworth, Anne Johnson, Julia Field, and W. Macdowall. 1999. Teenage fertility and life chances. *Rev Reprod* 4: 184-90.

Werner, B. 1987. Fertility statistics from birth registration in England and Wales, 1837-1987. *Population Trends* 48: 4-10.

Winkelstein, Warren, M.A. Stenchever, and Abe Lilienfeld. 1958. Occurence of pregnancy, abortion, and artificial menopause among women with coronary artery disease: a preliminary study. *Journal of Chronic Disability* 7(4): 273-286.

Winkelstein, Warren and Rakate, A.C. 1964. Age trend of mortality from coronary heart disease in women and observations on the reproductive patterns of those affected. *American Heart Journal* 67: 481-488.