

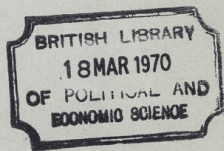
GENERAL REGISTER OFFICE

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② 42(CR7)

THE
REGISTRAR GENERAL'S
STATISTICAL REVIEW
OF
ENGLAND AND WALES
FOR THE YEAR
1966

PART III
COMMENTARY



LONDON

HER MAJESTY'S STATIONERY OFFICE

PRICE £1 7s. 0d. [£1.35] NET

MINISTRY OF HEALTH
AND GENERAL REGISTER OFFICE

**Report on Hospital In-patient
Enquiry for the year 1966**

Part I: Tables

This volume, one of an annual series, contains detailed tables based on a ten per cent sample of discharges (including deaths) in 1966 from National Health Service hospitals (other than psychiatric hospitals) in England and Wales. It includes analyses by age, sex and hospital region of residence of hospital patients, diagnosis and duration of stay in hospital.

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1970

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UNITED KINGDOM

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D I A G R A M S

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EXPLANATORY NOTES

1. New changes in presentation

A number of tables which have previously appeared frequently or regularly in the Commentary volume of the *Statistical Review* have been transferred, with effect from 1965, to become regular tables in Parts I and II of the *Review*. Details of the tables so transferred and of their new numbers have been published in the Explanatory Notes of the two volumes concerned.

2. Populations

The estimates of population appearing in this volume and described as 'home', 'total' or 'civilian' have the following content:

- Home population* - the population, of all types, actually in England and Wales, distributed by area according to residence.
- Total population* - the home population *plus* members of H.M. Forces belonging to England and Wales and serving overseas but *minus* the Forces of other countries temporarily in England and Wales.
- Civilian population* - the total population *minus* members of H.M. Forces belonging to England and Wales at home or overseas.

3. Stillbirths

Classification of stillbirths by cause is according to the Supplementary List, set out on pages 336-348 of the *International Statistical Classification of Diseases, Injuries and Causes of Death, 1955* (Seventh Revision), with further sub-division of certain rubrics, and as modified by the following changes of assignment:

Cause of stillbirth	Rubrics to which cause is assigned	
	(i) in International Classification	(ii) in Statistical Review
Patent ductus arteriosus Patent foramen ovale Congenital heart condition NOS Foetal heart condition NOS	} } 39.5 }	{ 38.41 38.43 38.45 38.45

4. Numbering of tables

Of the tables referred to in this *Review*, those numbered in Arabic numerals (without prefix) will be found in 'Part I, Tables, Medical' and those lettered will be found in 'Part II, Tables, Population' for the year in question, while those numbered in Arabic numerals with the prefix C appear in this volume.

5. Standardised mortality comparison

The Comparative Mortality Index introduced in 1942 has since 1958 been replaced by a Standardised Mortality Ratio which shows the number of deaths registered in the year of experience as a percentage of those which would have been expected in that year had the sex/age mortality of a standard period (1950-1952) operated on the sex/age population of the year of experience.

6. Indication of reliability

Rates given as 0 indicate that the actual rate is less than one half a unit. A dash (-) in any cell indicates that there were no events. Where a cell has been left blank no denominator is available.

Rates calculated from less than 20 events are distinguished by italic type as a warning to the user that the smallness of the experience may affect their reliability as a measure.

Numbers

If d represents the deaths in an area and p the population in that area then, if d/p is small, the standard error (s.e.) of d is approximately \sqrt{d} assuming that the deaths are independent of one another. Clearly, the larger the number of deaths the smaller will be the proportionate variability. A deviation either way of twice the s.e. may be expected about once in 20 times. Using this criterion one might expect towns each averaging 20 deaths per year to yield in the same year numbers ranging between 11 and 29 without such differences having any statistical significance. Alternatively it could be said that if 20 deaths were recorded for a town, this number would have a 95 per cent confidence interval of approximately ± 9 , there being a 95 per cent chance that the underlying mortality is represented by a number of deaths within this interval.

If d is thought to be an extreme variation it would be more reliable to use as the standard error not \sqrt{d} but $\sqrt{d'}$ where d' is the number of deaths expected if some standard rate (e.g. the national rate) were applied.

Rates

The appropriate standard error of a death rate when d represents the number of deaths and p the population is

$$\frac{\sqrt{d}}{p} \quad \text{or} \quad \frac{m}{\sqrt{d}}$$

where m is the death rate. The difference between two local death rates m_1 and m_2 can be regarded as significant only if it amounts to more than twice the standard error of the difference, viz.

$$2 \sqrt{\left(\frac{m_1^2}{d_1} + \frac{m_2^2}{d_2} \right)}$$

Comparison of adjusted rates

Before comparisons are made, other known sources of variation (such as differences in the sex and age composition of the population) must be removed. If C is the local death Area Comparability Factor then mC is to be compared with m' , the national death rate. The s.e. of mC is

$$C \sqrt{\left(\frac{m}{p} \right)}$$

and

$$mC \pm 2C \sqrt{\left(\frac{m}{p} \right)}$$

is to be compared with m' . As already indicated, m' can be used instead of m in the calculation of the s.e.; m' has the advantage of itself having only a small sampling error.

7. Abbreviations

A.C.	administrative county.
C.B.	county borough.
M.B.	municipal borough.
L.B.	London borough.
U.D.	urban district.
R.D.	rural district.

Greater London the Greater London Council Area, comprising the City of London (including the Inner and Middle Temple) and the London boroughs.

8. Regions

The constitution and naming of the standard regions of England and Wales was changed at the beginning of 1965. Those used in this volume are composed as follows:-

North	West Midlands	South West
Cumberland Durham Northumberland Westmorland Yorkshire, North Riding	Herefordshire Shropshire Staffordshire Warwickshire Worcestershire	Cornwall Devon Dorset, Part of ⁴ Gloucestershire Somerset Wiltshire
Yorkshire and Humberside	East Anglia	Wales I (South East)
Lincolnshire, Parts of Lindsey Yorkshire, East Riding Yorkshire, West Riding	Cambridgeshire and Isle of Ely Huntingdon and Peterborough Norfolk Suffolk, East Suffolk, West	Breconshire Carmarthenshire Glamorgan Monmouthshire
North West	South East	Wales II (Remainder)
Cheshire Derbyshire, Part of ¹ Lancashire	Bedfordshire Berkshire Buckinghamshire Dorset, Part of ³ Essex Greater London Hampshire Hertfordshire Kent Oxfordshire Surrey Sussex, East Sussex, West Wight, Isle of	Anglesey Caernarvonshire Cardiganshire Denbighshire Flintshire Merionethshire Montgomeryshire Pembrokeshire Radnorshire
East Midlands		
Derbyshire, Part of ² Leicestershire Lincolnshire Parts of Holland Parts of Kesteven Northamptonshire Nottinghamshire Rutland		

¹ Buxton M.B., Glossop M.B., New Mills U.D., Whaley Bridge U.D., Chapel en le Frith R.D.

² All except areas in 1 above.

³ Poole M.B. only.

⁴ All except Poole M.B.

9. Outer Metropolitan Area

The part of the South East Region outside Greater London is split in some tables into Outer Metropolitan area and Remainder of South East. The composition of the Outer Metropolitan area is as follows:-

	<i>Buckinghamshire, Part of</i>	<i>Kent, Part of</i>
<i>Hertfordshire</i>	Aylesbury M.B. Beaconsfield U.D. Bletchley U.D. Chesham U.D. Eton U.D. High Wycombe M.B. Marlow U.D. Slough M.B. Amersham R.D. Aylesbury R.D. Eton R.D. Wing R.D. Wycombe R.D.	Chatham M.B. Dartford M.B. Gillingham M.B. Gravesend M.B. Maidstone M.B. Northfleet U.D. Rochester M.B. Royal Tunbridge Wells M.B. Sevenoaks U.D. Southborough U.D. Swanscombe U.D. Tonbridge U.D. Dartford R.D. Maidstone R.D. Malling R.D. Sevenoaks R.D. Strood R.D. Tonbridge R.D.
<i>Surrey</i>		
<i>Bedfordshire, Part of</i>	<i>Essex, Part of</i>	<i>Oxfordshire, Part of</i>
Luton C.B. Dunstable M.B. Leighton - Linslade U.D. Luton R.D.	Southend-on-Sea C.B. Basildon U.D. Benfleet U.D. Brentwood U.D. Canvey Island U.D. Chelmsford M.B. Chigwell U.D. Epping U.D. Harlow U.D. Rayleigh U.D. Thurrock U.D. Waltham Holy Cross U.D. Chelmsford R.D. Epping and Ongar R.D. Rochford R.D.	Henley-on-Thames M.B. Henley R.D.
<i>Berkshire, Part of</i>	<i>Hampshire, Part of</i>	<i>Sussex, East, Part of</i>
Reading C.B. Maidenhead M.B. New Windsor M.B. Wokingham M.B. Bradfield R.D. Cookham R.D. Easthampstead R.D. Windsor R.D. Wokingham R.D.	Aldershot M.B. Farnborough U.D. Fleet U.D. Hartley Wintney R.D.	Burgess Hill U.D. Cuckfield U.D. East Grinstead U.D. Cuckfield R.D. Uckfield R.D.
		<i>Sussex, West, Part of</i>
		Crawley U.D. Horsham U.D. Horsham R.D.

10. Conurbations

The conurbation areas each consist of an aggregation of entire local authority areas and are constituted as follows:-

	<i>Tyneside</i>	
<i>Durham (part)</i>	<i>Northumberland (part)</i>	
Gateshead C.B. South Shields C.B.	Newcastle upon Tyne C.B. Tynemouth C.B.	Newburn U.D. Wallsend M.B. Whitley Bay M.B.
Felling U.D. Hebburn U.D. Jarrow M.B. Whickham U.D.	Gosforth U.D. Longbenton U.D.	
	<i>West Yorkshire</i>	
	<i>Yorkshire, West Riding (part)</i>	
Bradford C.B. Dewsbury C.B. Halifax C.B. Huddersfield C.B. Leeds C.B. Wakefield C.B.	Colne Valley U.D. Denby Dale U.D. Denholme U.D. Elland U.D. Heckmondwike U.D. Holmfirth U.D.	Mirfield U.D. Morley M.B. Ossett M.B. Pudsey M.B. Queensbury and Shelf U.D. Ripponden U.D.
Aireborough U.D. Baildon U.D. Batley M.B. Bingley U.D. Brighouse M.B.	Horbury U.D. Horsforth U.D. Keighley M.B. Kirkburton U.D. Meltham U.D.	Rothwell U.D. Shipley U.D. Sowerby Bridge U.D. Spenborough M.B. Stanley U.D.
	<i>South East Lancashire</i>	
<i>Cheshire (part)</i>	<i>Lancashire (part)</i>	
Stockport C.B.	Bolton C.B. Bury C.B. Manchester C.B. Oldham C.B. Rochdale C.B. Salford C.B.	Kearsley U.D. Lees U.D. Littleborough U.D. Little Lever U.D. Middleton M.B.
Alderley Edge U.D. Altrincham M.B. Bowdon U.D. Bredbury and Romiley U.D. Cheadle and Gatley U.D.	Ashton-under-Lyne M.B. Audenshaw U.D. Chadderton U.D. Crompton U.D. Denton U.D.	Milnrow U.D. Mossley M.B. Prestwich M.B. Radcliffe M.B. Royton U.D.
Dukinfield M.B. Hale U.D. Hazel Grove and Bramhall U.D. Hyde M.B.	Droylsden U.D. Eccles M.B. Failsworth U.D. Farnworth M.B. Heywood M.B.	Stretford M.B. Swinton and Pendlebury M.B. Tottington U.D. Urmston U.D. Wardle U.D.
Marple U.D. Sale M.B. Stalybridge M.B. Wilmslow U.D.	Horwich U.D. Irlam U.D.	Westhoughton U.D. Whitefield U.D. Whitworth U.D. Worsley U.D.
Disley R.D.		

Merseyside

<i>Cheshire (part)</i>		<i>Lancashire (part)</i>
Birkenhead C.B. Wallasey C.B.	Ellesmere Port M.B. Hoylake U.D. Neston U.D. Wirral U.D.	Bootle C.B. Liverpool C.B. Crosby M.B. Huyton-with-Roby U.D. Litherland U.D.

West Midlands

<i>Staffordshire (part)</i>		<i>Warwickshire (part)</i>
Dudley C.B. Walsall C.B. West Bromwich C.B. Wolverhampton C.B. Aldridge-Brownhills U.D.		Birmingham C.B. Solihull C.B. Sutton Coldfield M.B. <i>Worcestershire (part)</i> Warley C.B. Halesowen M.B. Stourbridge M.B.

Greater London

The City of London (with the Inner Temple and Middle Temple) and the London Boroughs

11. Hospital regions

The hospital regions presented in this volume consist of aggregations of entire local authority areas. They are identical with the areas of regional hospital boards except where the boundaries of the latter divide local authority areas. Any such divided local authority area is allocated to the hospital region containing the greater proportion of the population.

Newcastle

<i>Cumberland</i>		<i>Yorkshire, North Riding (part)</i>
<i>Durham</i>	Middlesbrough C.B.	Skelton and Brotton U.D. Thornaby-on-Tees M.B.
<i>Northumberland</i>	Eston U.D. Guisborough U.D.	Croft R.D. Northallerton R.D.
<i>Westmorland (part)</i>	Loftus U.D. Northallerton U.D. Redcar M.B. Richmond M.B.	Reeth R.D. Richmond R.D. Startforth R.D.
Appleby M.B.	Saltburn and Marske-by-Sea U.D.	Stokesley R.D.
North Westmorland R.D.		

Leeds

<i>Yorkshire, East Riding</i>	<i>Yorkshire, West Riding (part)</i> (except areas stated in Sheffield Region)
<i>Yorkshire, North Riding (part)</i> (except areas stated in Newcastle Region)	

Sheffield

<i>Leicestershire</i>	<i>Yorkshire, West Riding (part)</i>	
<i>Lincolnshire</i> Parts of Holland Parts of Lindsey	Barnsley C.B. Doncaster C.B. Rotherham C.B. Sheffield C.B.	Royston U.D. Stocksbridge U.D. Swinton U.D. Tickhill U.D.
<i>Nottinghamshire</i>	Adwick-le-Street U.D. Bentley with Arksey U.D. Conisbrough U.D. Cudworth U.D. Darfield U.D.	Wath-upon-Dearne U.D. Wombwell U.D. Worsbrough U.D.
<i>Derbyshire (part)</i> (except areas stated in Manchester Region)	Darton U.D. Dearne U.D. Dodworth U.D. Hoyland Nether U.D. Maltby U.D.	Doncaster R.D. Kiveton Park R.D. Penistone R.D. Rotherham R.D.
<i>Lincolnshire</i> Parts of Kesteven (part) (except areas stated in East Anglian Region)		Thorne R.D. Wortley R.D.
<i>Rutland (part)</i>	Oakham U.D. Oakham R.D. Uppingham R.D.	Mexborough U.D. Penistone U.D. Rawmarsh U.D.

East Anglian

<i>Cambridge and Isle of Ely</i>	<i>Suffolk, West</i>	<i>Lincolnshire</i> Parts of Kesteven (part)
<i>Huntingdon and Peterborough</i>	<i>Essex (part)</i>	Stamford M.B. Bourne U.D. South Kesteven R.D.
<i>Norfolk</i>	Saffron Walden M.B. Saffron Walden R.D.	
<i>Suffolk, East</i>	<i>Hertfordshire (part)</i>	<i>Rutland (part)</i>
	Royston U.D.	Ketton R.D.

North West Metropolitan		
<i>Bedfordshire</i>	<i>Berkshire (part)</i>	<i>Greater London (part)</i>
<i>Hertfordshire (part)</i> (except areas stated in <i>East Anglian and North</i> <i>East Metropolitan Regions</i>)	Maidenhead M.B. New Windsor M.B. Cookham R.D. Easthampstead R.D. Windsor R.D.	Barnet L.B. Brent L.B. Camden L.B. Ealing L.B. Haringey L.B. Harrow L.B. Hillingdon L.B. Hounslow L.B. Islington L.B. Richmond-upon-Thames L.B. Westminster L.B.
<i>Surrey (part)</i>	<i>Buckinghamshire (part)</i>	
Staines U.D. Sunbury-on-Thames U.D.	Beaconsfield U.D. Eton U.D. Slough M.B. Eton R.D.	
North East Metropolitan		
<i>Essex (part)</i> (except areas stated in <i>East Anglian Region</i>)	<i>Hertfordshire (part) -ctd.</i>	<i>Greater London (part) -ctd.</i>
<i>Hertfordshire (part)</i>	Ware U.D. Braughing R.D. Hertford R.D. Ware R.D.	Barking L.B. Enfield L.B. Hackney L.B. Havering L.B. Newham L.B. Redbridge L.B. Tower Hamlets L.B. Waltham Forest L.B.
Bishop's Stortford U.D. Cheshunt U.D. Hertford M.B. Hoddesdon U.D. Sawbridgeworth U.D.	<i>Greater London (part)</i>	
	City of London Inner and Middle Temple	
South East Metropolitan		
<i>Kent</i>	<i>Greater London (part)</i>	
<i>Sussex, East</i>	Bexley L.B. Bromley L.B. Greenwich L.B.	Lewisham L.B. Southwark L.B.
South West Metropolitan		
	<i>Hampshire (part)</i>	<i>Greater London (part) - ctd.</i>
<i>Surrey (part)</i> (except areas stated in <i>North</i> <i>West Metropolitan Region</i>)	Aldershot M.B. Farnborough U.D. Fleet U.D.	Hammersmith L.B. Kensington and Chelsea L.B. Kingston-upon-Thames L.B. Lambeth L.B. Merton L.B. Sutton L.B. Wandsworth L.B.
<i>Sussex, West</i>	<i>Greater London (part)</i>	
	Croydon L.B.	

Wessex				
<i>Wight, Isle Of</i>		<i>Wiltshire (part)</i>		
<i>Dorset (part)</i> (all areas except <i>Lyme Regis M.B.</i>)		Salisbury M.B. Wilton M.B. Amesbury R.D. Mere and Tisbury R.D. Salisbury and Wilton R.D.		
<i>Hampshire (part)</i> (except areas stated in <i>South West Metropolitan Region</i>)				
Oxford				
<i>Northamptonshire</i>	<i>Gloucestershire (part)</i>	<i>Wiltshire (part)</i>		
<i>Oxfordshire</i>	Cirencester U.D.	Marlborough M.B. Swindon M.B.		
<i>Berkshire (part)</i> (except areas stated in <i>North</i> <i>West Metropolitan Region</i>)	Cirencester R.D. North Cotswold R.D. Northleach R.D.	Cricklade and Wootton Bassett R.D. Highworth R.D. Marlborough and Ramsbury R.D. Pewsey R.D.		
<i>Buckinghamshire (part)</i> (except areas stated in <i>North</i> <i>West Metropolitan Region</i>)				
South Western				
<i>Cornwall</i> <i>Devon</i> <i>Somerset</i>	<i>Gloucestershire (part)</i> (except areas stated in <i>Oxford Region</i>)			
<i>Dorset (part)</i>	<i>Wiltshire (part)</i> (except areas stated in <i>Wessex and Oxford Regions</i>)			
Lyme Regis M.B.				
Welsh				
All areas in Wales including Monmouthshire				
Birmingham				
<i>Herefordshire</i>	<i>Shropshire</i>	<i>Staffordshire</i>	<i>Warwickshire</i>	<i>Worcestershire</i>
Manchester				
<i>Cheshire (part)</i> (except areas stated in <i>Liverpool Region</i>)			<i>Derbyshire (part)</i>	
<i>Lancashire (part)</i> (except areas stated in <i>Liverpool Region</i>)			Buxton M.B. Glossop M.B. New Mills U.D. Whaley Bridge U.D.	
<i>Westmorland (part)</i> (except areas stated in <i>Newcastle Region</i>)			Chapel en le Frith R.D.	

Liverpool

Cheshire (part)

Birkenhead C.B.
 Chester C.B.
 Wallasey C.B.

Bebington M.B.
 Ellesmere Port M.B.
 Hoylake U.D.
 Lymm U.D.
 Neston U.D.
 Runcorn U.D.

Wirral U.D.
 Chester R.D.
 Runcorn R.D.
 Tarvin R.D.

Lancashire (part)

Bootle C.B.
 Liverpool C.B.
 St. Helens C.B.
 Southport C.B.
 Warrington C.B.

Crosby M.B.
 Formby U.D.
 Golborne U.D.
 Haydock U.D.
 Huyton with Roby U.D.
 Kirkby U.D.

Litherland U.D.
 Newton-le-Willows U.D.
 Ormskirk U.D.
 Prescott U.D.
 Rainford U.D.
 Skelmersdale U.D.
 Widnes M.B.

Warrington R.D.
 West Lancashire R.D.
 Whiston R.D.

12. Urban and rural aggregates

These aggregates comprise (a) the six conurbations combined, (b) the aggregates of urban local authority areas outside the conurbations in three groups according to the size of their resident population at the 1961 Census and (c) the aggregate of rural local authority areas outside the conurbations. Urban areas include boroughs and urban districts as defined by the Local Government Acts, and rural areas are rural districts as similarly defined.

13. Assignment of vital statistics by area

In all tables births and stillbirths are classified according to the area of usual residence of the mother, and deaths to the area of usual residence of the deceased, if this is within England and Wales; if not, to the area of occurrence. Accommodation provided under Parts III and IV of the National Assistance Act, 1948, is regarded as the place of residence of persons dying there. Before 1st January, 1958, chronic sick and psychiatric hospitals were similarly treated for this purpose but from that date the method of classification was modified, the main change being that a death in such a hospital is now assigned to the area of occurrence only if the deceased had been there six months or more. If the deceased had been there less than six months the death is transferred to the area of previous usual residence.

14. Index

An index has been compiled of the principal subjects of comment and the major tabulations in the Commentary volumes of the *Statistical Review* for the years 1952 to 1966 inclusive. This is included in the current volume and future revisions of the index will be published in subsequent volumes.

15. General

See also the Explanatory Notes to the Tables Volumes, Parts I and II.

INTRODUCTION

This Commentary completes the *Registrar General's Statistical Review* of England and Wales for 1966. Detailed medical and population statistics for the year have already been published in the Tables Volumes, Parts I and II of the *Review*.

In 1966 for the first time a national census of population was taken by sampling only, and the chapter on population contains a critical examination of migration estimates in the intercensal period 1961-1966, reviewed in the light of the sample census, and an account of the resulting revisions to the national population estimates. External migration is the subject of a separate chapter which describes the basis of the estimates derived from the International Passenger Survey and evaluates their accuracy. There is also a chapter on fertility trends and a special study of multiple births.

Among the medical subjects considered are the causes of mortality generally, cardiovascular disease and violence as causes of infant mortality, the accuracy of stated age at death, mortality from ischaemic heart disease on different days of the week, and the methods and results of a multiple cause coding study.

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 LONDON, W.C.2

August 1969

P O P U L A T I O N

Population in the year of the first Sample Census

On 24th April 1966 a Census of population was taken. This Census occurred only five years after the population had last been counted and, for the first time in this country, was taken by sample and not by full count. Prior to the 1961 Census a population estimate had been projected for Census Day and the final count was only 40 thousand more than this projected estimate. Projecting from the mid-1963-4-5 estimates it was to be expected that the home (*de facto*) population of England and Wales at 24th April 1966 would be 48.005 million persons, with 48.075 million at mid-1966. When actual births and deaths figures were known and final migration data were available, the mid-1966 forecast of 48.075 million stood firm but a better estimate for 24th April 1966 seemed to be 48.002 million persons.

The Sample Census count, however, yielded an estimated population of 47,135,510. At first sight this would suggest that the estimate derived from the mid-year estimates was too high by some 866 thousand; a serious indictment of the procedure used for making mid-year estimates 1961-66, if true.

Of necessity, however, the estimate was built up from the 1961 Census final figure as its base. While some commentators claimed that this was a slight *understatement*, it has never been alleged to have been an overstatement. This figure was 46,104,548 persons. The excess of live births over deaths during the five years from the 1961 Census was 1,496 thousand persons. The only other way the population could be affected was by net migration. The period included the fourteen months to 30th June 1962 before the Commonwealth Immigrants Act came into operation.

The estimated change may be set out as follows, if x = net migration to (or from) England and Wales and y = the figure of persons present in England and Wales on 24th April 1966 (*figures in thousands*):

$$46,105 + 1,496 \pm x = y$$

The estimated population at Census Day 1966, consistent with the mid-year intercensal estimates, had been put at 48,002, built up as follows:

$$46,105 + 1,496 + 401 = 48,002$$

But the grossed-up Sample Census result gave a figure of 47,136 for the population, which if true would imply a figure of -465 for net migration as a residual in the population change equation, as follows:

$$46,105 + 1,496 - 465 = 47,136$$

A special investigation into possible deficiencies in the Sample Census and a special examination of the national estimated balance of migration were clearly indicated. The results were as follows:

Revaluation of the Sample Census

The Census results are subject to error of the following kinds:

- (a) coverage error - omission of persons or households that should have been included in the sample;
- (b) response error - error in the basic data collected due to inaccurate or incomplete replies on the schedule;
- (c) processing error - errors occurring during editing, coding and punching of documents;
- (d) sampling error - chance that the population in 10 per cent of the dwellings were not exactly 10 per cent of the whole population in the area, or perfectly representative of the characteristics of the whole population.

After the Census, the following post-enumeration surveys were mounted in order to measure as accurately as possible the above types of error.

(a) Sample Frame Surveys

- (i) The plot check - a small plot containing on average about 15 dwellings was selected at random in each of the 1,300 Census Districts, and all households in it were listed. The lists were then compared with the sample frame to discover whether each household had a chance of selection for the Census. About one third of these plots contained no dwellings, and some contained more than 100 dwellings: altogether 20,627 dwellings were listed, of which 183 stood no chance of selection due to deficiencies in the 1961 sample frame. These deficiencies are believed to be due to omission of (i) some dwellings vacant in 1961, (ii) some dwellings which had not been residential in 1961, and (iii) some dwellings which were under conversion or repair in 1961.
- (ii) The underlap check - the sample obtained from the rating list was extended by continuing the same selection procedure to a later date; in this way an address list containing 95 per cent of the property occupied in April was constructed, and a brief questionnaire was sent to each householder to find out when the property had become occupied, and how many people were present at Census date. A response rate of about 75 per cent was achieved in this exercise, which was a complete survey on property which should have been included in the Sample; some 9,000 dwellings were estimated to have been omitted in England and Wales.

It is estimated that there is a one in twenty chance that the proportion of the whole population missed due to coverage error is outside the range 0.95 to 1.30 per cent.

(b) The Vacant/Absent Survey

One tenth of all dwellings recorded in the Census as 'vacant', 'absent' or 'derelict' were re-visited; out of a national sample of 8,344 it was found that 230 had been occupied on Census night - this corresponds to about 0.15 per cent of the population.

(c) The Social Survey Quality Check

A sample of approximately 5,000 of the households enumerated in the Census, covering 300 enumeration areas and 100 Census districts, were interviewed by Government Social Survey interviewers. The information about the household, given in the enumerator's records and in answer to questions on the Census form, was discussed in detail as a check on the quality of data provided by the householder and on the work of the enumerator. This survey included dwellings recorded as unoccupied and the results for these were in good agreement with the Vacant/Absent Survey.

It is estimated that response errors caused between 0.11 per cent and 0.29 per cent of the population to be omitted in the Census. This range is large as it has been calculated as the difference of gross under-enumeration and over-enumeration figures each of the order of magnitude of 1 per cent.

(d) The Check on Sampling Error

To establish whether the sampling procedure had caused the selection of a biased sample, the sample selected from the 1961 frame was re-run using 1961 data. This procedure was carried out for some 450 local authority areas, and some errors were detected; there was no evidence of bias, and the errors were apparently smaller than would have been expected from simple random sampling.

Conclusions

The above results do not give a complete analysis of the post-enumeration surveys, and more detail will be given in the statistical assessment of the 1966 Census: the results given in the preface to most of the Census volumes were estimates based on rounded figures, and sampling errors were not considered. It appears that at the *national* level, the population enumerated in the Census was probably between 1.0 per cent and 1.8 per cent below one tenth of the true population. Owing to the small samples used in the post-enumeration surveys, deficiency figures for Regions and other sub-national areas will not be sufficiently precise to enable them to be used to adjust the totals.

Critical examination of intercensal migration estimates

Since January 1964, the International Passenger Survey (conducted by the Government Social Survey) has provided invaluable data for estimating all external traffic, except that between England and Wales and the rest of the U.K. and between the U.K. and the Republic of Ireland. Its figures are however themselves grossed-up sample items and were therefore critically reviewed.

First suspect were the intercensal estimates of the net intake of aliens. In consultation with the Home Office and on examination of the Sample Census birthplace figures it was agreed to be possible that this element of net migration might have been over-estimated intercensally by 40 thousand.

The intercensal estimates had incorporated a net inflow of some 30 thousand per annum as the direct result of the traffic between the Republic of Ireland and this country. The change in the stock of Irish Republic born people in our population is made up of this net inflow from the Irish Republic, offset by deaths in this country among those born in what is now the Republic; also by a re-emigration of former immigrants from the Republic on U.K. passports, to countries other than the Republic, which is estimated to amount to about 10 thousand a year. As the Sample Census suggested there was only a net increase over the intercensal period in our population of 87 thousand persons born in the Republic, against a figure of the order of 100 thousand implicit in the mid-year intercensal estimates, it was decided to reduce this component in population growth by 15 thousand for the intercensal period as a whole.

It is of interest to note that the intercensal estimates of the net inflow of Commonwealth citizens incorporated in the mid-year estimates agreed closely with the Sample Census evidence in total.

For emigration on U.K. passports the Oversea Migration Board's figure for the years 1961 to 1964 had been used in compiling the mid-year estimates. From its reports it is obvious that the Board accepted emigration to elsewhere than Australia, New Zealand, Canada, S. Africa and U.S.A. as 'negligible' whereas the International Passenger Survey, after it became operative in 1964, showed a significant figure going to Europe. The net outward flow of persons with U.K. passports was therefore assessed as having been under-estimated intercensally by 35 thousand. In sum, the net migration component of intercensal population change was estimated as having been too high by 90 thousand and the revised population change equation therefore becomes:

$$46,105 + 1,496 + 311 = 47,912$$

This population figure of 47,912 thousand implies an under-enumeration in the Census of 1.6 per cent of the population, a figure which lies within the possible margin of error.

Some of the reduction in the mid-year estimates falls in the pre-International Passenger Survey period April 1961 - December 1962. There is no reason to amend the mid-1966 and mid-1967 estimates, apart from reduction by 90 thousand in the starting figure for each of these estimates. Accordingly the national home population estimates have been revised to:

47,985.3 thousand at mid-1966

48,300.8 thousand at mid-1967

The mid-1968 population has been estimated at 48.593 thousand persons. Details of these operations will appear in the 1967 Commentary.

The changes made necessary by the above exercises can be summarised as follows:

Table C1. Revised mid-year estimates (1961 to 1967) and estimate for mid-1968 of the total, home and civilian populations*, England and Wales

(Thousand persons)

Year	Total	Home	Civilian
1961	46,299	46,196	45,882
1962	46,780	46,682	46,391
1963	47,087	46,986	46,713
1964	47,454	47,344	47,083
1965	47,809	47,688	47,438
1966	48,099	47,985	47,732
1967	48,399	48,301	48,034
1968	48,669	48,593	48,319

*Population estimates as at 30th June each year

Greater London

For the London boroughs there was a particular discrepancy between Sample Census counts and the mid-year estimates. The Sample Census caught 770,000 persons in approximately one tenth of the dwellings in Greater London. From the mid-year estimates the forecast population for census day had however been 7,910 thousand persons in Greater London, suggesting a deficiency in the census count of three per cent. For Inner London (the old London County Council area) the estimate was over 4.5 per cent higher than the grossed-up sample items.

The small post-enumeration survey was not large enough to throw any light on this Greater London situation. But other sources did. First, the population under age 15 given by the Census was very substantially below the figures returned by LCC and Inner London Education Authority and the health visitors (who were formerly LCC employees until 1965 and for only one of the crucial five years in Borough employment). It also appeared that there was a deficiency in the younger adult age range.

Ad hoc investigations were made into the Sample Census situation of the Boroughs where the Census and estimate were most discrepant, but this shed little further light on the situation. Now in 1961 it happened that the Inner London population had been estimated at the same figure actually found in that year's Census; also the electorate change 1951-61 used in making the mid-year estimates,

was not remarkably different from the national change. The proportionate national change in the 1961-66 electorate was again similar to the Greater London change. It therefore appeared that for Greater London the evidence of the electoral register, together with the data on the child population mentioned above, gave a basis for assessing possible deficiencies in the Sample Census counts for localities, and the mid-year estimates should be re-assessed on this evidence.

Population estimates for sub-national areas

All sub-national population estimates were finally reviewed in the light of the electoral change estimate procedure (for which see 1964 Commentary). When controlled to the finally determined 1966 estimate for England and Wales and carried forward to mid-1968, this method gave the figures published in the 1968 Population Pamphlet.

Although the detailed explanation of all sub-national revisions is left over until the 1967 Commentary, it is possible to include in the present volume the details of population change for 1966-1967 and 1967-1968 for regions of England and Wales, and their sub-divisions which are now coming into use as a further useful level of analysis in regional matters. The figures given in tables C2 and C3 relate to the boundaries of each area as defined at 1st April, 1968. Column (5) - change in armed forces stationed in the area - is not the entire population change resulting from the deployment of armed forces into or out from the area concerned. To obtain the latter it is necessary to take into account the net gain to the civilian population by demobilisation (see pp.10 and 11 of the 1965 Commentary); it is however not possible to obtain figures or provide useful estimates, for small areas. Column (6), the balancing item in the table, is comprised of net gain to the civilian population by demobilisation, *plus* civilian migration *plus* any minute amendments to the natural change figures due to final births data becoming available. Net demobilisation of Armed Forces at a national level only amounted to 1.6 thousand in 1966-67, which leaves - 15.9 thousand as effectively the estimate of overall net civilian migration: for 1967-68, net demobilisation was however some 22.5 thousand leaving +22.5 thousand as being mainly overall net migration (England and Wales as a whole).

EXTERNAL MIGRATION

The methods of estimating overseas migration for England and Wales were described in the *Registrar General's Statistical Review of England and Wales for the year, 1963, Part III Commentary*.

The International Passenger Survey

The International Passenger Survey (IPS) is conducted by the Government Social Survey for the Board of Trade and other government departments. Although the Survey was launched in January, 1963, it did not come into full operation until January, 1964. Its purpose is to collect information on tourism, the balance of payments aspect of international travel, and overseas migration. A systematic sample stratified by ports is selected from all passengers travelling on the principal air and sea routes between the United Kingdom and other countries (with the exception of the Irish Republic).

As in other statistical fields, it is necessary to adopt conventions and definitions that are operationally practicable. For this reason and for the sake of international comparability, the Survey has adopted the convention of defining an immigrant (or emigrant) as a person who declares an intention to stay in the United Kingdom (or abroad) for an unbroken period of 12 months or more. (In fact, the reference period of the internationally agreed definition of a migrant is trivially different in that it relates to more than 12 months).

This statistical definition has its limitations. It is based on a declaration of intention that may not in the event be fulfilled. Migration as defined by the Survey is different from the component of the mid-year *de facto* population change that is due to movements across national boundaries; the latter is equivalent to the Survey's estimate adjusted for unfulfilled intentions and for the visitor balance at 30th June. The Survey's definition excludes the criterion of whether the object of the journey was to exercise an occupation, and consequently no distinction is made between temporary migrants, permanent migrants and visitors. It does not coincide exactly with definitions implicit in the legal and administrative regulations governing admissions into the United Kingdom. Finally, the Survey's definition differs from the Census definition, which defines an immigrant as a person whose former usual residence twelve months before census day was different from his present residence at census day, without any criterion of length of stay in this country. These differences in definition and in coverage have to be borne in mind when attempting comparisons between migration statistics derived from the International Passenger Survey and those derived from other sources.

The information collected by the IPS covers a wide range of the characteristics of migrants, and these are tabulated and published in the *Registrar General's Quarterly Return*, and, in greater detail, in the annual *Statistical Review*, Part II, Population. These characteristics are:

- (1) country of previous residence or intended future residence;
- (2) citizenship i.e. legal nationality;
- (3) route travelled i.e. short sea, long sea, short air, and long air - the short routes are European and Mediterranean, and the long routes are the remainder;
- (4) date of arrival/departure;
- (5) age, sex and marital status - the age is that at the last birthday, and the marital status categories are married, single and others;
- (6) year of arrival of Commonwealth citizens emigrating from the U.K.;
- (7) occupation - the information on occupation given in the IPS refers to the kind of work which the migrant performed in his last regular employment prior to migration.

The occupation statistics are of limited value because the act of migration may itself be associated with a change in occupation and the occupation frame is not capable of a unique connotation, especially for those immigrants coming from countries with economic and social structures widely different from those in the United Kingdom. Largely for these reasons, the occupation data are published for the following seven broad categories only:

- (a) Professional and Managerial: administrators, managers, and persons with professional and technological qualifications;
- (b) Manual and Clerical: all occupations other than those mentioned in (a);
- (c) Students: children aged 15 and over who are full-time at school, college, university, etc., excluding apprentices and trainees, who are classified under the occupation or profession for which they are training;
- (d) Armed Forces;
- (e) Housewives: persons who are responsible for most of the domestic duties in a household;
- (f) No occupation and not known: includes retired men over 65 and retired women over 60 who are no longer working, but excludes retired women who are also housewives;
(This category excludes refusals and non-contacts)
- (g) Children under 15.

Because of relatively small sampling fractions (which are discussed below) and the consequent decrease in reliability of estimates with increasing sub-division, the quarterly data published are restricted to broad categories. However, annual estimates are published in somewhat greater detail.

IPS coverage clearly does not exhaust the full range of characteristics on which there is a demand for information about migrants. For example, although data are collected for England, Wales, Scotland, and Northern Ireland separately,

full address information is not collected to give origin/destination detail within each of these countries. Consequently, full statistics on the impact of overseas migration on individual planning regions are not available (though some broad estimates of the regional split of overseas migration can be derived from the periodic Census data). Secondly data on the size and composition of migrant family units are not collected, and this gap restricts analyses relating to migrants' fertility and family structure. Finally, there is no information on motivation. However, experience in other survey work has shown that meaningful responses on these attributes are difficult to obtain and quantify, and in particular the IPS is not a suitable vehicle for questions about motivation.

The statistical reliability of estimates based on sample data depends largely on the size and the design of the sample. Because of the sheer volume of traffic, which reaches its peak in the summer months, the difficult circumstances in which interviews have to be conducted, especially on cross-channel boats, and the necessity to secure the voluntary co-operation of the transport and immigration authorities at a time when there are intensified international efforts to simplify frontier travel documentation and formalities, the absolute size of the sample has had to be kept relatively small in relation to the total volume of passenger traffic. On the long air routes nearly 7 per cent of the outgoing, and 4 per cent of the incoming passengers are interviewed at London Airport and at Prestwick; 2 per cent of the short air route passengers in winter and 1 per cent in the summer are also interviewed there. At the smaller airports, the percentage sampled generally varies between ½ per cent and 4 per cent according to the time and the airport concerned. On the short sea routes, where interviewing is carried out on board during the crossing, about 1 per cent of the winter and ½ per cent of the summer traffic are interviewed, subject to a pre-determined maximum number of interviews that is practicable during the time permitted by the journey. On the long sea routes, where interviewing is conducted on board immediately before landing or embarkation, nearly 7 per cent of outgoing and 4 per cent of incoming passengers are selected on liners or other ships having more than 200 passengers arriving or more than 100 passengers departing. One in every two ships carrying more than 12 passengers on these routes is also covered. A higher proportion of passengers leaving the U.K. on the long sea and air routes is sampled to provide reasonable accuracy for otherwise unobtainable data on the numbers and characteristics of emigrants.

Some measure of the statistical reliability of the IPS estimates is given by standard errors. The primary sampling unit is the individual passenger. The standard errors are derived on the assumption that the systematic procedure of interviewing 1 in every nth passenger is equivalent to a random selection. Account is taken of the stratified design of the Survey by calculating the variation attributable to individual ports. Tables C4 to C7 give grossed-up estimates and their standard errors, for a selection of migrants' characteristics.

The standard errors expressed as percentages of the estimates to which they relate illustrate how, generally speaking, the statistical reliability of the estimates varies directly with the sampling fraction and inversely with increasing sub-division. Consequently, the estimates of outward migration, because of the larger sampling fraction for outward passengers, tend to be more reliable than those of inward migration. Estimates relating to the short sea route, where the sampling fractions are lowest, have the largest percentage standard errors though not the largest in absolute terms. The same kind of unreliability attends estimates on particular details; for example, the standard errors for married

males over 65 are high in percentage terms, but in absolute terms they are not striking because of the rather small sizes of these particular parts of the migrant flows.

Table C4. IPS Statistics for U.K.; * migrants by method of travel for the year 1966

Route	Into the United Kingdom			From the United Kingdom		
	Estimated totals (thousands)	Standard error		Estimated totals (thousands)	Standard error	
		(thousands)	per cent		(thousands)	per cent
Short air	47.2	2.4	5	31.6	1.8	6
Long air	73.8	1.7	2	136.1	1.9	1
Short sea	52.0	3.4	7	29.8	2.5	8
Long sea	46.0	1.0	2	104.1	1.2	1
Total	219.1	4.6	2	301.6	3.8	1

* Details of definition and coverage of International Passenger Survey (IPS) data are given in the text

Table C5. IPS Statistics for U.K.; number of migrants in each quarter of 1966

Quarter and year	Into the United Kingdom			From the United Kingdom		
	Estimated totals (thousands)	Standard error		Estimated totals (thousands)	Standard error	
		(thousands)	per cent		(thousands)	per cent
March	40.8	1.6	4	64.2	1.4	2
June	52.8	2.3	4	66.2	1.7	3
September	80.1	3.2	4	92.5	2.5	3
December	45.4	1.8	4	78.7	1.7	2
Year	219.1	4.6	2	301.6	3.7	1

Table C6. IPS statistics for U.K.; age, sex and marital condition of migrants in 1966

Marital condition and age	Into the United Kingdom			From the United Kingdom		
	Estimated totals (thousands)	Standard error		Estimated totals (thousands)	Standard error	
		(thousands)	per cent		(thousands)	(thousands)
Males						
Married						
under 15	-	-	-	-	-	-
15-24	3.4	0.6	18	8.0	0.5	7
25-44	29.8	1.8	9	51.4	1.5	3
45-64	6.4	0.6	9	9.7	0.7	7
65+	1.2	0.3	23	1.6	0.3	16
Single						
under 15	21.4	1.1	5	41.4	1.1	3
15-24	29.6	1.9	6	23.5	1.2	5
25-44	15.8	1.4	9	13.3	0.9	7
45-64	0.5	0.1	29	0.7	0.1	16
65+	0.1	0.1	54	-	-	-
Others						
under 15	-	-	-	-	-	-
15-24	-	-	-	-	-	-
25-44	0.4	0.2	45	0.4	0.1	19
45-64	0.3	0.1	32	0.4	0.1	32
65+	0.3	0.1	28	0.5	0.1	18
Females						
Married						
under 15	-	-	-	-	-	-
15-24	9.9	1.0	10	14.3	0.9	6
25-44	22.7	1.3	6	39.4	1.2	3
45-64	3.5	0.4	12	7.2	0.5	8
65+	0.5	0.1	25	1.1	0.2	23
Single						
under 15	20.0	1.2	6	38.7	1.1	3
15-24	35.6	2.2	6	29.5	1.7	6
25-44	9.9	1.2	12	9.8	0.9	9
45-64	1.0	0.3	25	0.9	0.1	18
65+	0.2	0.1	43	0.5	0.4	72
Others						
under 15	-	-	-	-	-	-
15-24	0.3	0.2	76	0.1	-	45
25-44	0.7	0.2	29	1.0	0.2	21
45-64	1.5	0.3	19	2.5	0.3	11
65+	1.5	0.3	18	2.3	0.3	15

Table C7. IPS statistics for Professional and Managerial Occupations of migrants in 1966

Occupation and route	Into the United Kingdom			From the United Kingdom		
	Estimated totals (thousands)	Standard error		Estimated totals (thousands)	Standard error	
		(thousands)	per cent		(thousands)	(thousands)
Administrative						
Air	2.1	0.4	18	3.1	0.4	14
Short Sea	0.7	0.4	50	0.4	0.3	73
Long Sea	1.0	0.2	16	1.0	0.1	12
All routes	3.8	0.5	14	4.5	0.5	12
Doctors and Dentists						
Air	2.0	0.3	14	1.9	0.3	18
Short Sea	0.1	0.1	99	0.8	0.5	62
Long Sea	0.4	0.1	26	0.8	0.1	14
All routes	2.5	0.3	13	3.5	0.6	18
Nurses						
Air	3.2	0.4	15	3.9	0.4	9
Short Sea	0.7	0.4	55	0.1	0.1	99
Long Sea	1.5	0.2	13	2.4	0.2	8
All routes	5.3	0.6	12	6.5	0.4	6
Teachers						
Air	6.9	0.9	13	5.2	0.7	13
Short Sea	3.0	0.8	26	0.3	0.3	100
Long Sea	2.8	0.3	9	3.2	0.2	7
All routes	12.7	1.2	10	8.7	0.8	9
Engineers and Scientists						
Air	3.2	0.5	15	5.2	0.5	10
Short Sea	0.8	0.5	53	1.4	0.7	46
Long Sea	1.1	0.2	15	2.6	0.2	7
All routes	5.0	0.6	13	9.2	0.9	9
Others						
Air	6.4	0.7	11	8.9	0.6	6
Short Sea	3.6	0.9	24	2.7	0.8	30
Long Sea	2.6	0.2	10	4.8	0.3	5
All routes	12.5	1.1	9	16.3	1.0	6
Total						
Air	23.7	1.4	6	28.2	1.2	4
Short Sea	8.9	1.4	15	5.7	1.2	22
Long Sea	9.3	0.5	5	14.8	0.5	3
All routes	41.9	2.0	5	48.7	1.8	4

Note

As figures have been rounded to the nearest final digit, there may be an apparent discrepancy between the sum of the constituent items and the total shown; the percentage is calculated on the unrounded figures.

Migration as an element in *de facto* population change in England and Wales

The changing citizenship composition of annual net movement is shown in the estimates in Table C8, which identifies each stream by the citizenship of the people in them. Each of them is 'net' in the sense that it is the balance between the main flow, which may be inwards to England and Wales or outwards from England and Wales, and the corresponding return flow. The figures in this table cover categories outside the scope of the IPS (other countries in the United Kingdom and the Irish Republic) and therefore differ from IPS figures quoted in other tables.

Table C8 Estimated net intake (+) or outflow (-) of categories of migrants, mid-1959 to mid-1967, England and Wales*

(Thousands)							
Year ending 30th June	On foreign passports/	On passports from the Old Commonwealth countries/	On passports from the New Commonwealth countries	By direct traffic with Irish Republic	From the rest of the U.K.	On U.K. passports beyond the U.K. and the Irish Republic	Net migration
1960	+ 30	+ 10	+ 65	+ 32	+ 24	- 37	+ 124
1961	+ 18	+ 10	+ 130	+ 33	+ 29	- 46	+ 174
1962	+ 19	+ 8	+ 177	+ 29	+ 30	- 56	+ 207
1963	+ 19	- 3	+ 50	+ 28	+ 32	- 91	+ 35
1964	+ 20	+ 10	+ 73	+ 27	+ 31	- 124	+ 37
1965	+ 22	+ 1	+ 55	+ 29	+ 27	- 109	+ 25
1966	+ 24	- 2	+ 42	+ 27	+ 27	- 116	+ 2
1967	+ 30	+ 5	+ 45	+ 32	+ 19	- 142	- 11

* For a description of the revision of past figures of the streams see Population chapter page 5.

/ Including those of the Republic (formerly Union) of South Africa.

Z Australia, New Zealand, Canada.

A more accurate picture of the net loss from England and Wales to overseas countries of British citizens is obtained from the above table than from figures of the overall gross flows, which are inflated by the movement of aliens and Commonwealth citizens. For instance the volume of non-British emigration from the United Kingdom is substantial; between 1964 and 1967, the figure, according to the International Passenger Survey, was 281 thousand, representing just under one-quarter of U.K. overseas emigration. This movement is a factor, however small, in the upward trend of emigration from the U.K. to Canada; between 1964 and 1967, about 10.3 thousand non-British citizens emigrated from the U.K. to Canada, which represented nearly 5 per cent of the total emigration there.

Statistics on the economic characteristics of both the inward and outward migrants are available only from the IPS, and therefore Table C9 provides indications of the broad occupation distribution of migration only for the period since 1964, in respect of movements between England and Wales and countries beyond the British Isles.

Table C9. Occupation by country of last or intended future residence - England and Wales

Outwards (beyond British Isles)								(Thousands)
Country of intended future residence	Professional and Managerial	Manual and Clerical	Armed Forces	Students	Housewives	No Occupation and 'not stated'	Children	
mid-1964 to mid-1965								
Commonwealth	24.2	53.7	0.7	5.9	21.4	4.0	41.4	
Old	13.9	44.3	0.6	2.7	16.7	3.0	33.1	
New	10.4	9.5	0.1	3.1	4.6	1.1	8.2	
Foreign	15.7	31.6	0.4	8.8	9.7	4.1	15.2	
Europe	6.3	16.9	0.2	5.4	3.1	2.8	4.6	
U.S.A.	4.7	8.1	-	1.9	3.4	0.5	5.3	
Other	4.8	6.7	0.3	1.6	3.1	0.8	5.2	
mid-1965 to mid-1966								
Commonwealth	24.3	61.3	0.6	6.0	19.2	3.8	47.1	
Old	14.3	51.0	0.4	2.4	15.1	2.6	38.3	
New	9.9	10.3	0.1	3.4	4.2	1.2	8.9	
Foreign	14.4	27.1	0.2	8.6	9.5	5.3	15.5	
Europe	5.1	13.7	0.1	5.4	4.1	4.4	5.1	
U.S.A.	4.6	6.6	0.1	1.7	2.9	0.5	4.5	
Other	4.7	6.9	-	1.5	2.5	0.4	5.9	
mid-1966 to mid-1967								
Commonwealth	28.1	69.4	0.7	5.1	24.0	3.8	56.0	
Old	17.4	57.8	0.6	2.5	19.3	3.0	47.0	
New	10.7	11.5	-	2.6	4.6	0.8	9.1	
Foreign	21.2	28.6	0.5	8.6	11.9	5.7	17.9	
Europe	7.6	12.8	0.2	4.5	4.5	4.5	5.0	
U.S.A.	7.7	7.5	-	1.7	4.0	0.6	7.5	
Other	5.9	8.4	0.3	2.4	3.4	0.6	5.4	

Table C9 -(continued) Occupation by country of last or intended future residence - England and Wales

Inwards (from beyond British Isles) (Thousands)

Country of last residence	Professional and Managerial	Manual and Clerical	Armed Forces	Students	Housewives	No Occupation and 'not known'	Children
mid-1964 to mid-1965							
Commonwealth	19.8	30.0	0.4	17.0	15.6	3.8	27.2
Old	7.5	11.4	0.4	1.8	4.0	1.4	5.9
New	12.3	18.6	-	15.2	11.8	2.5	21.3
Foreign	15.5	28.7	0.5	15.4	10.0	3.0	12.9
Europe	7.1	22.6	0.5	9.3	5.1	2.1	5.8
U.S.A.	4.5	3.0	-	2.1	2.9	0.6	4.0
Other	4.0	3.1	-	4.1	2.0	0.4	3.0
mid-1965 to mid-1966							
Commonwealth	20.0	27.7	0.5	13.5	13.0	4.1	22.4
Old	7.5	12.0	-	1.2	3.2	1.1	4.9
New	12.5	15.7	0.5	12.3	9.8	3.0	17.6
Foreign	20.1	30.6	0.5	17.8	9.4	3.5	10.9
Europe	10.9	24.0	0.3	12.2	4.7	2.1	4.3
U.S.A.	5.0	3.3	0.1	2.8	2.8	0.6	4.4
Other	4.4	3.4	-	2.9	2.0	0.8	2.3
mid-1966 to mid-1967							
Commonwealth	18.8	29.0	0.7	14.3	15.8	4.8	25.6
Old	8.3	13.7	0.3	1.3	4.7	1.0	6.3
New	10.5	15.4	0.5	12.9	11.1	3.8	19.3
Foreign	17.6	27.9	0.7	18.6	9.8	4.8	13.2
Europe	7.0	21.6	0.6	11.7	3.6	3.2	4.4
U.S.A.	5.2	2.6	-	2.3	3.4	0.6	4.5
Other	5.3	3.6	0.1	4.7	2.8	0.9	4.3

Old Commonwealth: Australia, New Zealand and Canada
 New Commonwealth: Commonwealth minus Old Commonwealth

In both the major occupation groups, viz. the Professional and Managerial, and the Manual and Clerical, England and Wales was a net exporter of population to overseas countries, particularly to the Commonwealth. The net loss to the Commonwealth as a whole conceals divergent patterns within it; in these occupation groups, England and Wales was increasingly losing population to the Old and was gaining, although decreasingly, people from the New Commonwealth countries. Within the Old Commonwealth, the occupation composition of migration shows that, on balance, Canada was, to an increasing extent, a more important recipient of Professional and Managerial emigrants than the rest of the Old Commonwealth; between mid-1964 and mid-1967, Canada's net gain in this group was 15.1 thousand, compared with 7.1 thousand for Australia and New Zealand combined. Although the relative importance of these destinations was the reverse with the Manual and Clerical workers, this position was changing; net emigration to Canada in this group increased from 7.3 thousand in mid-1964/65 to 12.6 thousand in mid-1965/66, to 17.9 thousand in mid-1966/67, while the corresponding flow for the rest of the Old Commonwealth remained virtually unchanged at about 26 thousand per annum.

Within the foreign category, there was net immigration from Europe, and net emigration to U.S.A. and the remaining foreign countries in both occupation groups.

B I R T H S

Fertility trends and mean family size

Introduction

The fall in the number of live births observed in the calendar year 1965 continued at about the same rate in 1966. The number of live births which occurred in England and Wales in 1966 was 849,823. This is 1.5 per cent lower than in 1965, which in turn was 1.5 per cent lower than the 1964 figure. The changes in numbers of live births between 1955 and 1967 are shown in Table C10.

Table C10. Changes in number of live births, England and Wales

Year	Live births	Per cent change since previous year	Per cent change in legitimate live births per 1,000 married women since previous year
1955	667,811	-0.9	-1.0
1956	700,335	+4.9	+4.3
1957	723,381	+3.3	+3.0
1958	740,715	+2.4	+2.2
1959	748,501	+1.1	+0.7
1960	785,005	+4.9	+3.9
1961	811,281	+3.3	+3.8
1962	838,736	+3.4	+1.6
1963	854,055	+1.8	+0.5
1964	875,972	+2.6	+1.5
1965	862,725	-1.5	-1.9
1966	849,823	-1.5	-1.3
1967	832,164	-2.1	-2.7

Relating the live births to the whole population gives crude rates per 1,000 home population of 17.7 in 1966, 18.1 in 1965 and 18.5 in 1964, showing a decline between 1964 and 1966 of 4.3 per cent. Since this birth rate per 1,000 population at all ages does not permit a true appreciation of fertility trends, changes in which may be masked by changes in sectors of population not concerned with child-bearing, births are more appropriately related to the number of women of child-bearing age (conventionally taken as 15-44) instead of the whole population, and further, the legitimate and illegitimate births may be related to the married and

unmarried women respectively in the age-group 15-44. The legitimate live birth rate per 1,000 married women aged 15-44 in 1966 was 124.1 compared with 125.7 in 1965 and 128.2 in 1964, a decline of 3.2 per cent between 1964 and 1966. While the legitimate birth rate has been declining, the illegitimate birth rate has been showing a continuous rise: in 1966 it was 21.5 per 1,000 unmarried women aged 15-44, compared with 21.2 in 1965 and 20.3 in 1964, showing an increase of 4.4 per cent between 1964 and 1965, with a further increase between 1965 and 1966 of 1.4 per cent.

It is now clear that 1965 marked the beginning of a downward trend in British fertility. Although the decline in fertility was first noticed in 1965, age-specific fertility rates were, in fact, fairly stable over the period 1962 to 1964, after the steep rise since the mid 1950s. Another look at Table C10 shows that between 1955 and 1964 there was an annual average increase of 3.1 per cent in the number of live births; the increases between 1962 and 1964 were relatively smaller than this average; only in 1958 and 1959 were the increases again smaller than the average.

A comparison of the changes in the last column seems to confirm the view that by 1962, legitimate fertility had at last reached a stable position. Diagrams 1a-1d are displays of the continuous record of mean family size of cohorts married between 1925 and 1966 by certain marriage durations. For cohorts married in the 1950s, the achieved mean family size has, in general, been rising for each succeeding cohort at corresponding marriage durations but from about 1962, the mean family size has stopped rising for nearly all durations and has been levelling out. In the following text it will be shown that there are two possible main causes for this levelling out:

- (a) the marriage cohorts of the 1950s increasingly produced most of their children in the early years of their marriage and were tending to complete their families more rapidly;
- (b) the marriage cohorts of the mid 1960s seem to be somewhat delaying their child-bearing.

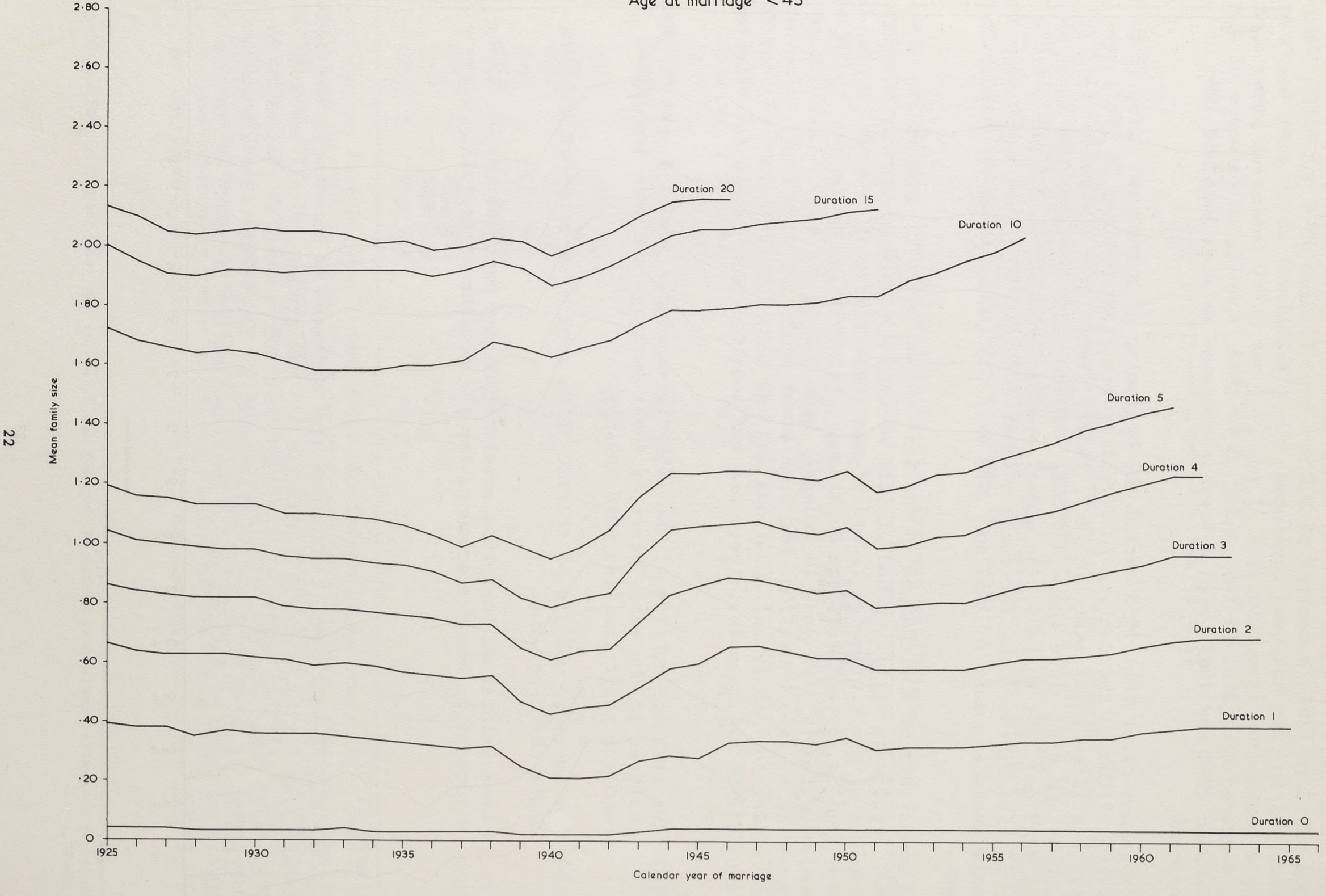
It is here maintained that this acceleration and postponement of family building in successive decades accounts for the decline in fertility rates since 1964.

Legitimate births

In the 1962 Commentary*, it was shown that the trend of increase in the number of legitimate live births since 1955 affected all age groups and all marriage cohorts. Evidence since the 1962 analyses confirmed that 1965 marked the beginning of another trend - a downward trend in the number of legitimate live births despite the continued trend of falling age at marriage and net increase in the number of married women.

* The Registrar General's Statistical Review of England and Wales for the year 1962, Part III Commentary, pages 54-57.

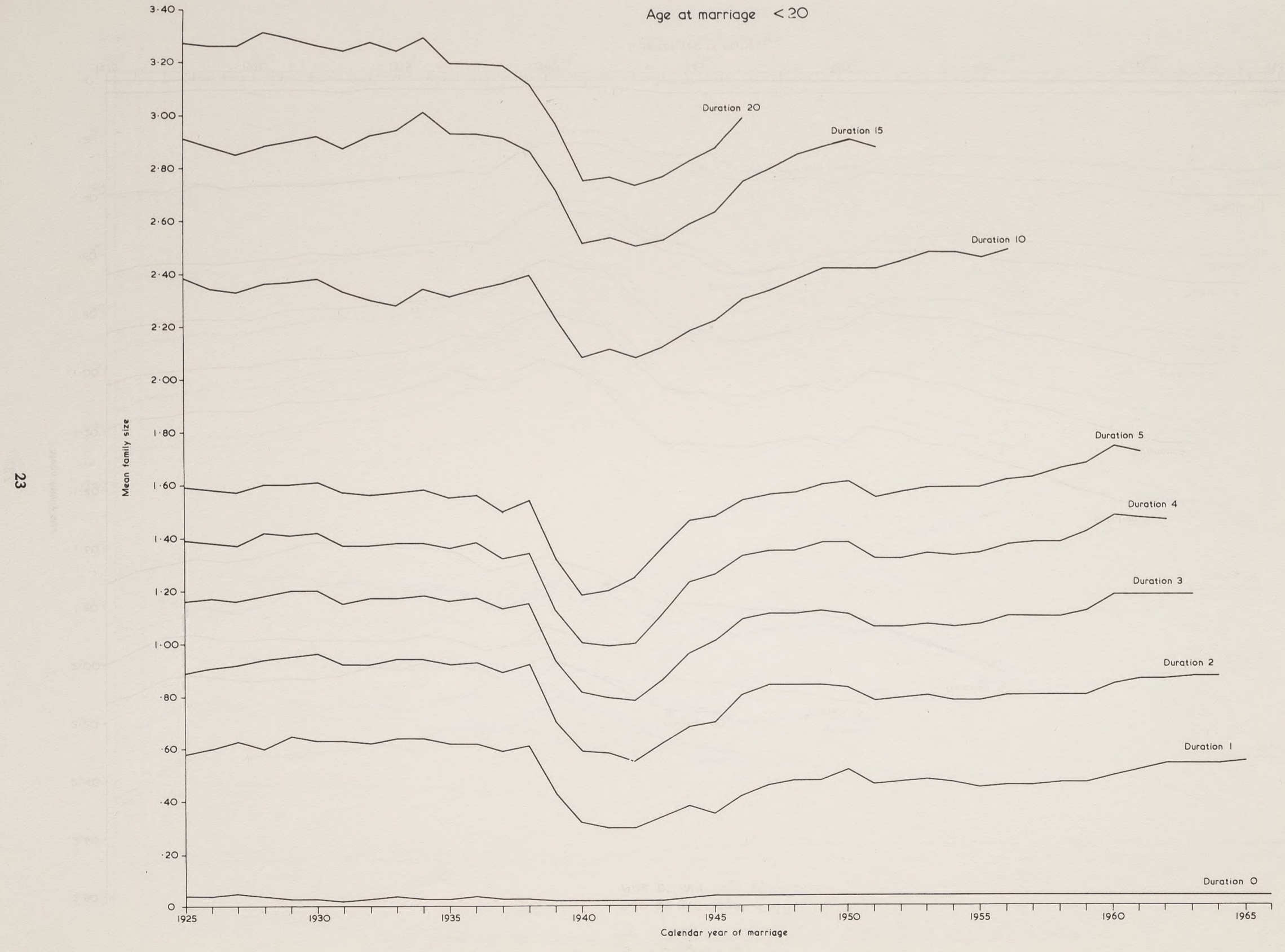
Diagram 1a
Age at marriage < 45



22

Mean family size by calendar year and duration of marriage, 1925 to 1966, England and Wales

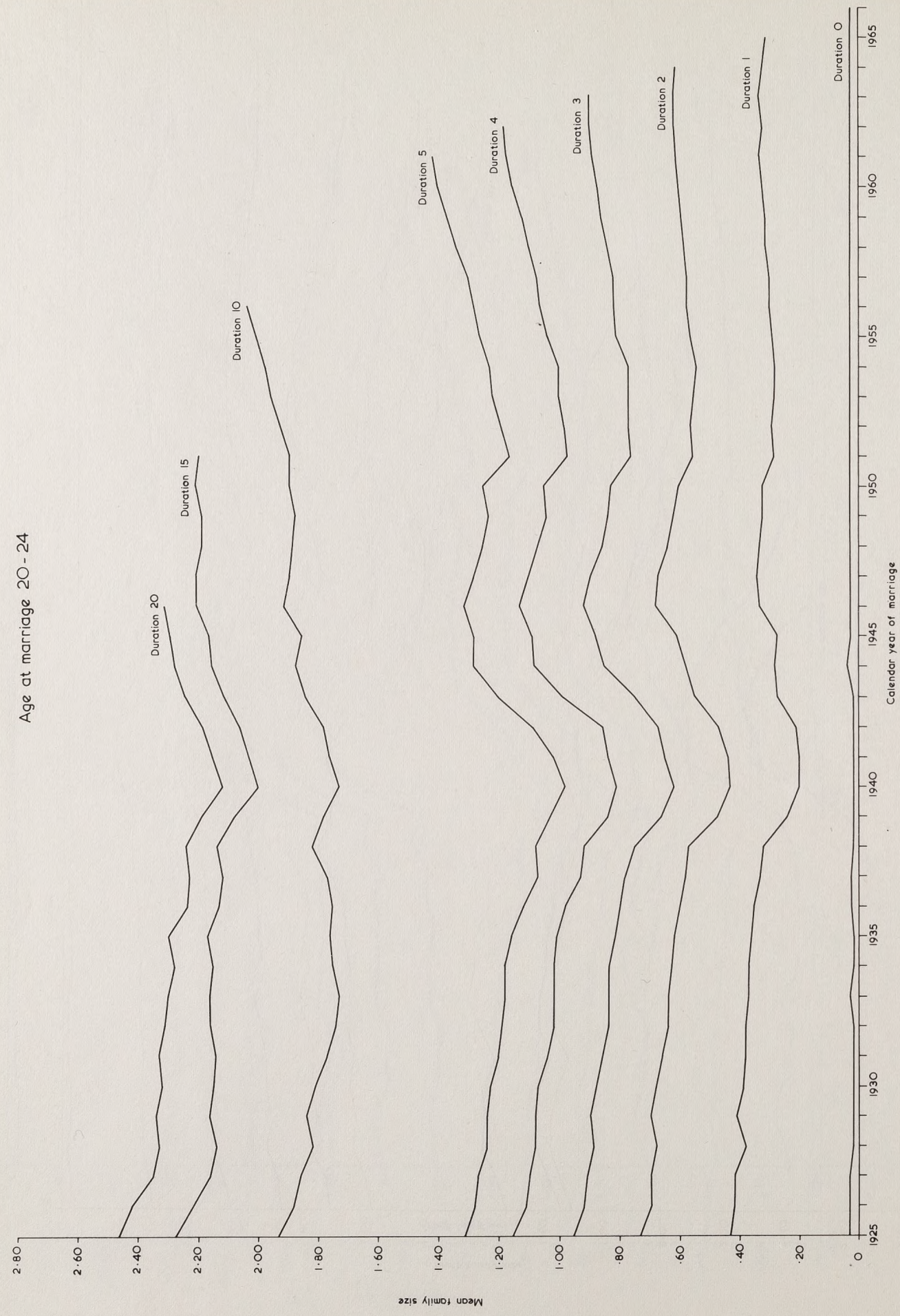
Diagram 1b
Age at marriage < 20



23

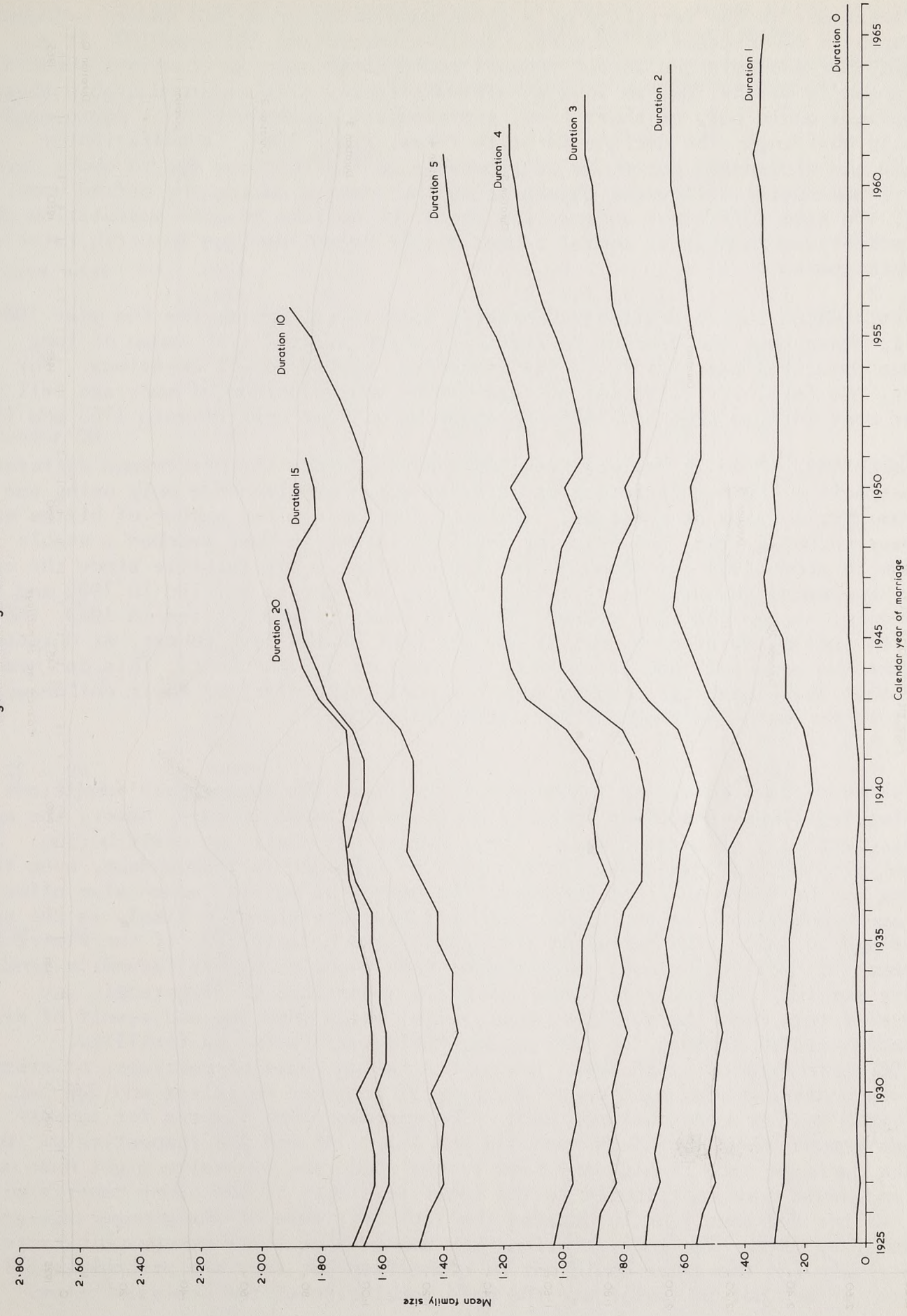
Mean family size by calendar year and duration of marriage, 1925 to 1966, England and Wales

Diagram 1c
Age at marriage 20-24



Mean family size by calendar year and duration of marriage, 1925 to 1966, England and Wales

Diagram 1d
Age at marriage 25-29



Mean family size by calendar year and duration of marriage, 1925 to 1966, England and Wales

Variations in the fertility of a given population group are caused principally by changes in two classes of factors; socio-economic and demographic. It is conceded that economic and social factors could cause some fluctuations about a level trend in births, but as long as ultimate family size remained stable these fluctuations could only be short term, representing accelerations or postponements in family building. The decline in birth rates, since 1964, is sufficiently profound and widespread not to be attributable to fluctuations due to short term economic and social influences obtaining in the country during the period under review. We have sufficient information about the decline to make speculation about the possible demographic or social causes of the recent decline in birth rates a worthwhile pursuit.

Table KK(b) in the Registrar General's Statistical Review for the year 1966, Part II, shows that the decline in fertility which started with women of long marriage durations has, but for a few instances, spread to all durations. For example, the fertility rates for all age-groups and durations of marriage fell by 2.7 per cent between 1964 and 1965 and again by 1.9 per cent between 1965 and 1966.

Table C11, which is derived from Table KK(b), shows the percentage difference of age-specific legitimate fertility rates of women married once only using the previous year's rates as the base. Although the fall in the number of births was not observed until 1965, the level of fertility seems to have reached a stable position in about 1962 (as shown by the table) after a big increase since the mid 1950s. Following through the fertility history of cohorts married in 1962 and 1963, for example, we see that for mothers 20 to 24 years of age married in 1963, the fertility rate at duration 0 fell by 0.3 per cent on the 1962 cohort, at duration 1 there was the same fall and at duration 2 a fall of 3.0 per cent. This can mean either that these marriage cohorts were postponing the start of their childbearing or that there was a new tendency to a lower fertility.

Demographic factors affecting legitimate fertility. The demographic conditions affecting legitimate fertility could be ascribed to three factors, namely the age-specific fertility of married women, their number and their age distribution. In the analysis that follows these factors will be regarded as independent, even though they may not be quite so. For instance, the number of married women also affects their age composition, as the higher the marriage rate the more likely is the age at marriage to fall. The fertility rate could also be affected, if there were a phenomenon of 'self-selection' among women, with those of higher fecundity tending to marry earlier. However, it seems virtually impossible to disentangle any evidence of this from the available statistics, which show the end result of all the complex social factors, as well as any biological factor in fertility. Table QQ(c) in Part II, 1966 shows that after twelve years of marriage, of every 1,000 women married when aged under 20, only 21 remained childless and 235 had given birth to 4 or more children each. The corresponding figures for age-at-marriage groups 20-24 and 25-29 were 113 and 127; 146 and 108 respectively. But when the marriage rate is high any less fecund women who otherwise might have married later and would have contributed to the lower fertility of the older cohorts might marry earlier and thus tend to depress the fertility rate of the younger age-group to which they fall. The interrelationships among these three demographic factors are intrinsic and therefore could not be quantified but they are probably small enough in effect not to invalidate the main conclusion of the analysis below.

Table C11. Percentage difference of Table KK(b) fertility rates using the previous year's rates as the base 1961 to 1966, England and Wales

Age of mother at birth	Year	Marriage duration (completed years)						
		All durations	0-	1-	2-	3-	4-	5-9
All ages under 50	1961	+ 3.0	+ 2.8	+ 1.0	+ 3.9	+ 4.5	+ 3.7	+ 5.1
	1962	+ 1.9	+ 3.6	+ 0.3	+ 1.5	+ 0.8	+ 3.6	+ 1.4
	1963	+ 0.9	+ 0.0	+ 1.7	+ 2.9	+ 3.1	+ 0.0	+ 1.4
	1964	+ 2.8	+ 1.7	+ 0.3	+ 2.1	+ 3.4	+ 2.6	+ 0.7
	1965	- 2.7	+ 0.0	+ 0.7	- 2.4	- 1.8	- 1.3	- 4.0
	1966	- 1.9	- 2.5	- 1.7	+ 1.1	- 1.1	- 1.7	- 2.8
Under 20	1961	+ 1.1	+ 2.6	+ 0.3	- 6.5	- 20.5		
	1962	+ 0.2	+ 1.0	+ 0.0	+ 3.8	+ 4.4		
	1963	- 0.7	- 0.2	- 0.3	+ 4.0	+ 3.6		
	1964	+ 2.5	+ 4.3	+ 0.0	- 2.6	- 2.5		
	1965	+ 0.7	+ 0.6	+ 0.9	- 2.1	- 1.0		
	1966	- 1.1	- 1.7	+ 0.9	+ 1.8	- 5.9		
20 - 24	1961	+ 2.9	+ 1.0	+ 1.3	+ 5.9	+ 5.7	+ 3.3	+ 0.0
	1962	+ 1.1	+ 2.3	+ 0.0	+ 1.4	+ 0.4	+ 4.4	- 0.5
	1963	+ 0.4	- 0.3	+ 1.3	+ 1.0	+ 2.2	- 2.7	+ 0.9
	1964	+ 0.7	- 0.3	- 0.3	+ 1.7	+ 2.8	+ 2.0	- 0.5
	1965	- 2.1	- 1.6	+ 0.3	- 3.0	- 2.7	- 2.3	- 6.1
	1966	- 2.1	- 4.0	- 2.6	+ 1.0	- 1.1	- 2.8	- 1.5
25 - 29	1961	+ 3.6	+ 1.7	+ 2.9	+ 1.9	+ 4.9	+ 4.0	+ 5.5
	1962	+ 1.0	+ 4.1	- 0.7	+ 0.8	+ 0.4	+ 3.0	+ 1.2
	1963	+ 0.5	- 0.3	+ 2.8	+ 4.5	+ 1.9	- 0.4	+ 0.0
	1964	+ 1.0	+ 0.3	+ 1.0	+ 3.6	+ 4.5	+ 2.5	+ 0.6
	1965	- 3.8	+ 0.0	+ 0.7	- 1.4	- 0.7	- 0.4	- 5.7
	1966	- 3.0	- 3.3	- 2.7	+ 1.1	- 0.4	- 0.8	- 3.6
30 - 34	1961	+ 1.8	- 1.1	- 5.7	+ 0.4	+ 0.0	+ 1.0	+ 4.0
	1962	+ 0.9	+ 8.4	+ 3.8	- 0.4	+ 0.4	+ 2.5	+ 0.8
	1963	+ 0.9	- 1.0	+ 3.7	+ 8.8	+ 8.4	+ 5.9	+ 0.0
	1964	+ 0.9	+ 3.4	+ 2.1	- 1.5	+ 0.4	+ 3.2	+ 1.5
	1965	- 6.1	- 2.6	- 4.8	+ 1.2	- 2.8	- 4.5	- 5.2
	1966	- 5.6	- 2.7	+ 6.2	- 3.5	- 3.3	- 3.7	- 3.9
35 - 39	1961	+ 4.0	- 4.0	- 7.1	- 0.6	+ 2.0	+ 1.4	+ 4.6
	1962	- 1.9	+10.5	+ 4.1	- 4.0	+ 1.9	- 0.7	+ 0.0
	1963	+ 0.0	+ 1.0	+ 4.9	+ 7.1	+ 12.1	+12.2	+ 2.2
	1964	+ 2.0	+ 2.8	+ 4.2	+ 6.0	- 1.1	+ 0.0	+ 2.2
	1965	- 1.9	- 3.7	- 0.9	- 5.7	+ 2.3	- 0.6	+ 0.0
	1966	- 7.8	- 2.4	- 5.5	+ 0.5	- 5.6	- 1.9	- 5.3
40 - 44	1961	+ 0.0	+ 0.0	- 1.2	- 11.6	+ 7.0	- 3.6	- 2.9
	1962	+ 0.0	+ 0.0	+ 6.2	+ 6.6	- 6.6	+ 5.6	+ 2.9
	1963	- 6.7	- 7.9	+ 1.2	- 3.1	+ 15.8	- 10.5	+ 0.0
	1964	+ 0.0	+ 5.7	- 1.2	+ 6.3	- 4.5	- 2.0	- 2.9
	1965	- 7.1	- 4.1	- 1.2	- 4.5	- 1.6	+ 8.0	- 5.9
	1966	- 7.7	- 7.0	- 15.5	+ 3.1	- 8.1	- 3.7	+ 0.0

The number of married women aged 15 - 44 in the population increased by about 2.8 per cent between 1955 and 1966; although there has been a greater increase (7.2 per cent) in first marriage rates, there also has correspondingly been a greater wastage through divorce (an increase of 39.1 per cent). While the increase in the number of married women was not spectacular, the effect of change in their age distribution was noteworthy. The effect on fertility of change in age distribution and increase in the population of married women, between 1964 and 1966, can be measured by applying the 1964 fertility rate to the population of married women in 1966. Thus the effect of the change in the three demographic conditions named above can be summarised as shown in Table C12.

Table C12. Elements of change in legitimate fertility, 1955 to 1966, England and Wales

Period	Increase in legitimate live births due to:					
	Increase in age-specific fertility rates		Increase in number of married women		Younger age distribution of married women	
	Number	Per cent	Number	Per cent	Number	Per cent
1955-56	24,886	82.5	3,126	10.4	2,144	7.1
1956-58	26,558	70.4	892	2.4	10,298	27.3
1958-60	30,511	80.6	51	0.1	7,298	19.3
1960-62	21,589	52.6	4,628	11.3	14,841	36.1
1962-64	12,379	42.3	15	0.0	16,886	57.7
1964-66	- 53,843	- 180.3	5,218	17.5	18,760	62.8

* The figures show that the fall in the number of legitimate live births after 1964 was due to the fall in age-specific fertility rates alone. Since 1955, when the continuous rise in the number of legitimate live births started, the proportion of this increase due to age-specific fertility rates has been falling, first markedly in 1960-62, and again in 1962-64. The effect of increase in the number of married women has been rather erratic, but the increase of about 8 per cent in the first marriage rate between 1964 and 1966 should, of itself, have tended to increase births. Before proceeding to consider that part of increase in legitimate births which is due to changes in the population of married women, it should be noted that no account had been taken so far of the distribution of married women within any current age-group according to their marriage age and duration of marriage. The fall in age at marriage means that the married women in any current age-group will have a younger 'age-at-marriage' distribution and a longer 'duration of marriage' distribution than would have been the case otherwise.

The fall in the age-specific fertility rates, as observed earlier (1965 Commentary, page 70), first started with women in the older childbearing age-groups, longer marriage durations and higher parity. This probably is not unexpected as these women consist of two groups: firstly, the group that married

before the Second World War, that had relatively low fertility rates in their early reproductive years of life but unusually high fertility rates during the 1950s; and secondly, women who married at earlier ages during the 1950s and had children sooner than women in earlier years, and who by the early 1960s were reaching the later reproductive ages - 30 years and over. Thus, the earlier high marital fertility was responsible in part for some of the fall in age-specific fertility rates at later ages. There has also been a fall in fertility rates at the younger childbearing ages and although women married under age 25 made a greater contribution to the number of legitimate births, the graph, Diagram 2, shows that this increased contribution was due only to the increase in the number of women married at ages under 25.

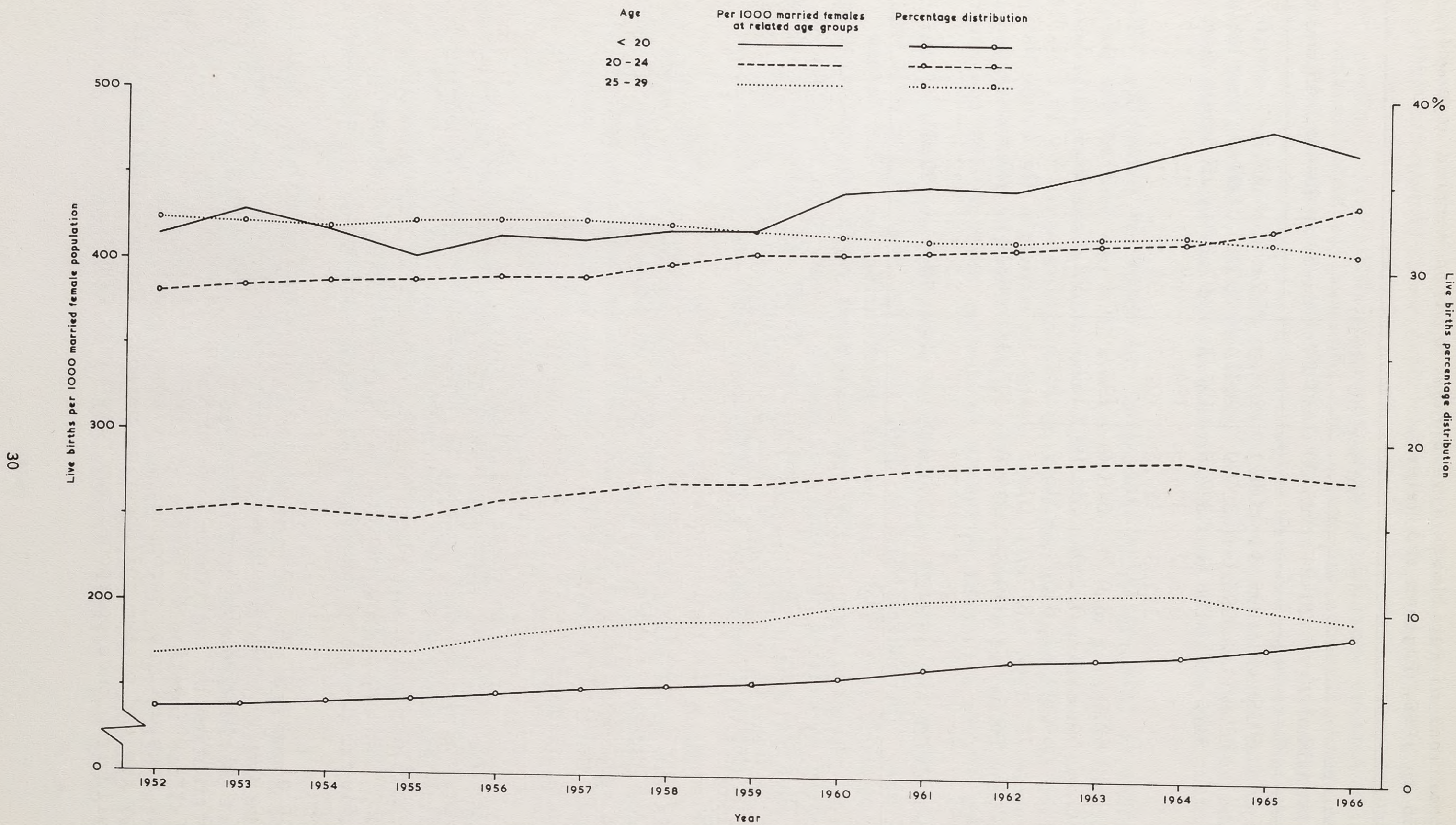
At this juncture it is worth while looking at the long-term prospects. The number of women of childbearing age (15-44 years) was 19.6 per cent of the total population in 1966 and according to the mid-1967 population projection this proportion was expected to fall to 19.1 per cent by 1975 rising again to 19.7 by 1980. The fertility of women in 1966 was only large enough to maintain the crude birth rate of the total population at a level slightly higher than the rate observed in 1960 which was 17.1. This situation is likely to change, however, for two reasons:

- (a) the prospective increase in the number of young men and women of childbearing age. The babies born in 1946, the first year of the post war boom in marital fertility, are now of childbearing age. The larger numbers of children born in 1947 and subsequent years are following them and greatly increasing the number of people in the young childbearing ages. Thus the population of women in the 15-29 age group, where childbearing is heavily concentrated, was 5.0 million in 1967 and this number was projected to increase to 5.1 million in 1970 and to 5.3 million in 1975;
- (b) there is the possibility of accelerated childbearing by the recent cohorts that have postponed the starting of their childbearing. Thus, given the present age-specific fertility rates and the present rate and age at marriage, there is a tendency to an increase in the annual number of legitimate births.

Changes in ultimate family size. Although the births of one or two years cannot contribute very much to the overall problem of identifying trends in completed fertility, the birth statistics in 1967 confirmed the apparent trend in the fall in age-specific fertility which was first visibly noticed in 1965 but had been latent since 1962. The underlying factors in the recent fall in annual fertility * may either be a general desire to have fewer children than before or a change in spacing of births.

Quite marked changes in the pattern of family building would be a consequence * of stable ultimate family size, but also of a continuous fall in age at marriage and an early start of childbearing soon after marriage. Table C13 shows the proportional distribution of legitimate live births by current age of mother.

Diagram 2



Legitimate live births by age of mother, 15-29, 1952 to 1966 England and Wales

Table C13. Proportions of legitimate live births to women married once only, 1955 to 1966, England and Wales

Year	Age of mother at birth							
	All Ages	Under 20	20-24	25-29	30-34	35-39	40-44	45 and over
1955	1,000	44.5	295.3	326.1	208.8	94.1	29.3	2.0
1956	1,000	48.9	297.6	326.9	201.9	95.6	27.3	1.8
1957	1,000	51.5	298.8	327.5	197.3	97.8	25.3	1.8
1958	1,000	53.4	305.2	324.5	194.1	98.1	22.9	1.7
1959	1,000	55.0	311.3	320.5	191.7	98.1	21.7	1.6
1960	1,000	57.9	310.7	318.0	193.1	94.6	24.2	1.7
1961	1,000	64.1	312.9	316.0	189.0	92.1	24.4	1.5
1962	1,000	69.6	315.6	315.7	185.5	87.8	24.5	1.4
1963	1,000	71.9	317.7	318.5	182.2	84.8	23.7	1.3
1964	1,000	74.5	319.8	319.6	177.5	83.9	23.5	1.2
1965	1,000	79.8	328.4	316.1	170.0	81.8	22.4	1.4
1966	1,000	86.3	342.8	309.6	162.4	77.1	20.3	1.4

The table shows that the proportions of births to women at ages 25 and above have been decreasing very rapidly in recent years. In 1955, mothers under 25 years of age accounted for only 34.0 per cent of legitimate live births while mothers aged 25-34 accounted for 53.5 per cent. In 1962 the proportions were 38.5 and 50.1 per cent respectively; in 1966 they were 42.9 and 47.2 per cent. Of particular importance is the rapid increase in the proportion of births to mothers under 20 years of age. This has increased by almost 100 per cent from 4.5 per cent of legitimate live births in 1955 to 8.6 per cent in 1966. This suggests a trend towards a shorter active childbearing life and heavier concentration of births during the earlier durations of marriage.

The fall in legitimate fertility in 1965 and 1966 has affected nearly all the age-at-marriage groups who married in these years except the age-group under 20 who had actually shown a rise in their fertility rate. It will take a few more years to see what the effect of this relatively low early marital fertility will be on the number of children these cohorts will have in their childbearing lives.

It can reasonably be suggested that factors such as the prospect of a continuing rise in the standard of living and better housing, the falling age of puberty and the 'fashion' for larger families, especially among the professional class in the population, are likely to work towards the increase of family size, while the effect of cheaper and more effective contraceptive methods resulting in the delay of the start of childbearing (and possibly comparatively longer intervals after starting) by young couples may work in the opposite direction. Whether ultimate family size could rise or fall depends on which of these two alternatives proves decisive. However, the lower fertility at the younger ages of recent years may eventually be accompanied by some reduction in the number of children born by the end of the childbearing period. The possibility is always there that a childbirth once postponed may never take place.

It was assumed, in the mid-1967 based population projections, that for a given age at marriage there would be little change in completed family size over the projection period from that estimated to have been reached for marriages in the late 1950s. The family sizes assumed are set out in Table C14 together with those used for the 1966 based populations. These estimates were based on the assumption that the cohorts who had started with lower fertility rates would eventually make up for the loss at longer durations.

Table C14. Mean completed family size

Calendar year of marriage	Mid-1966 based projections				Mid-1967 based projections			
	Age at marriage							
	Under 45	Under 20	20-24	25-29	Under 45	Under 20	20-24	25-29
1955	2.34	3.10	2.33	2.00	2.31	3.03	2.31	1.99
1958	2.43	3.10	2.38	2.05	2.42	3.04	2.38	2.07
1964	2.51	3.11	2.41	2.06	2.45	3.01	2.35	2.04
1973	2.58	3.19	2.42	2.08	2.49	3.06	2.35	2.03
1984	2.67	3.22	2.45	2.11	2.61	3.15	2.40	2.05

One clear picture that emerges is the relative stability of family size which recommends it as a basis for population projections. Nevertheless, this apparent advantage of family size as an instrument for population projection points to a weakness, in that it is insensitive to annual fluctuation in fertility level, for the quality of a good forecast is not only measured by the size of population forecast being achieved, but also by being distributed in the predicted form. Thus while the ultimate family size could be correctly predicted, the wide fluctuations in annual births, sometimes over a short period, could produce wide changes in the annual numbers of births over a number of years. A correct prediction of family size could mean that the population projection for the year 2000 would contain the forecast number of persons under 20, but despite this, the distribution of the under 20 population by individual years of age could be seriously in error.

The achieved mean family size of different cohorts at certain durations of their marriage can be estimated by accumulating fertility rates specific for year of marriage, age at marriage and duration of marriage. Such estimates are published annually as Tables PP and QQ(b) in Part II of the Registrar General's Statistical Review. By assuming some future fertility rates specific for year of marriage, age at marriage and duration of marriage, a projection of the mean family size on the basis of Table PP and Table QQ(b) referred to above could be made. Such a projection, assuming that the 1965/66 fertility rates would continue to apply to all cohorts, is shown in Table C15. This projection has two major defects, firstly, it is based on actual fertility observed at only one point in time and assumes this remains unchanged, and secondly, it imposes the fertility history of an older cohort on a younger one. For example, if the older cohort had been characterised by high fertility in the early years of marriage, its

fertility rates in later years would tend to be low; consequently, the ultimate family size of the younger cohorts with reduced fertility in the earlier years could be under-estimated. In spite of these defects, these projections show that the age-specific fertility rates of 1964 and 1966, if continued, both give an ultimate family size higher than that assumed in the 1967 based population projections (Table C14). The 1967 based projections implicitly assume, therefore, that most of the change in age-specific fertility rates of recent years was due to changes in family spacing, not in ultimate family size.

Table C15. Mean family size women married once only, by year of marriage and at certain durations, England and Wales

Calendar year of marriage and age at marriage	Duration of marriage (in years)					Mean ultimate family size	
	3	6	9	12	15	1964*	1966/
	Under 20						
1952	1.06	1.78	2.31	2.68	2.92	3.26	3.22
1955	1.07	1.82	2.33	2.64	2.88	3.26	3.18
1958	1.10	1.88	2.40	2.74	2.95	3.32	3.20
1961	1.18	1.96	2.49	2.77	2.98	3.40	3.24
1964	1.21	2.08	2.49	2.76	2.97	3.39	3.23
20-24							
1952	0.77	1.38	1.82	2.08	2.24	2.38	2.37
1955	0.81	1.47	1.90	2.16	2.33	2.46	2.43
1958	0.84	1.56	2.00	2.28	2.43	2.57	2.53
1961	0.89	1.64	2.12	2.37	2.49	2.65	2.59
1964	0.96	1.78	2.16	2.36	2.49	2.66	2.59
25-29							
1952	0.74	1.28	1.62	1.81	1.90	1.92	1.92
1955	0.80	1.40	1.75	1.94	2.03	2.06	2.03
1958	0.87	1.52	1.92	2.12	2.18	2.22	2.19
1961	0.92	1.58	2.01	2.16	2.22	2.29	2.24
1964	0.95	1.70	2.01	2.14	2.21	2.29	2.23

* These are estimates based on 1963/64 fertility rates assumptions.

/ These are estimates based on 1965/66 fertility rates assumptions.

Note: Figures that depend wholly or partly on future fertility are shown in italics.

Illegitimate births

The illegitimacy rate, the number of illegitimate live births per 1,000 unmarried women aged 15-44, was 21.5 in 1966 an increase of only 1.4 per cent over 1965 compared with an increase of 4.4 per cent in 1965 over 1964 and 6.3 per cent

in 1964 over 1963. This illegitimacy rate has increased by 109 per cent between 1955 and 1966. The continuous rise in the illegitimacy rate while the legitimacy rate is falling, marriage rate rising and age at marriage falling needs some careful investigation.

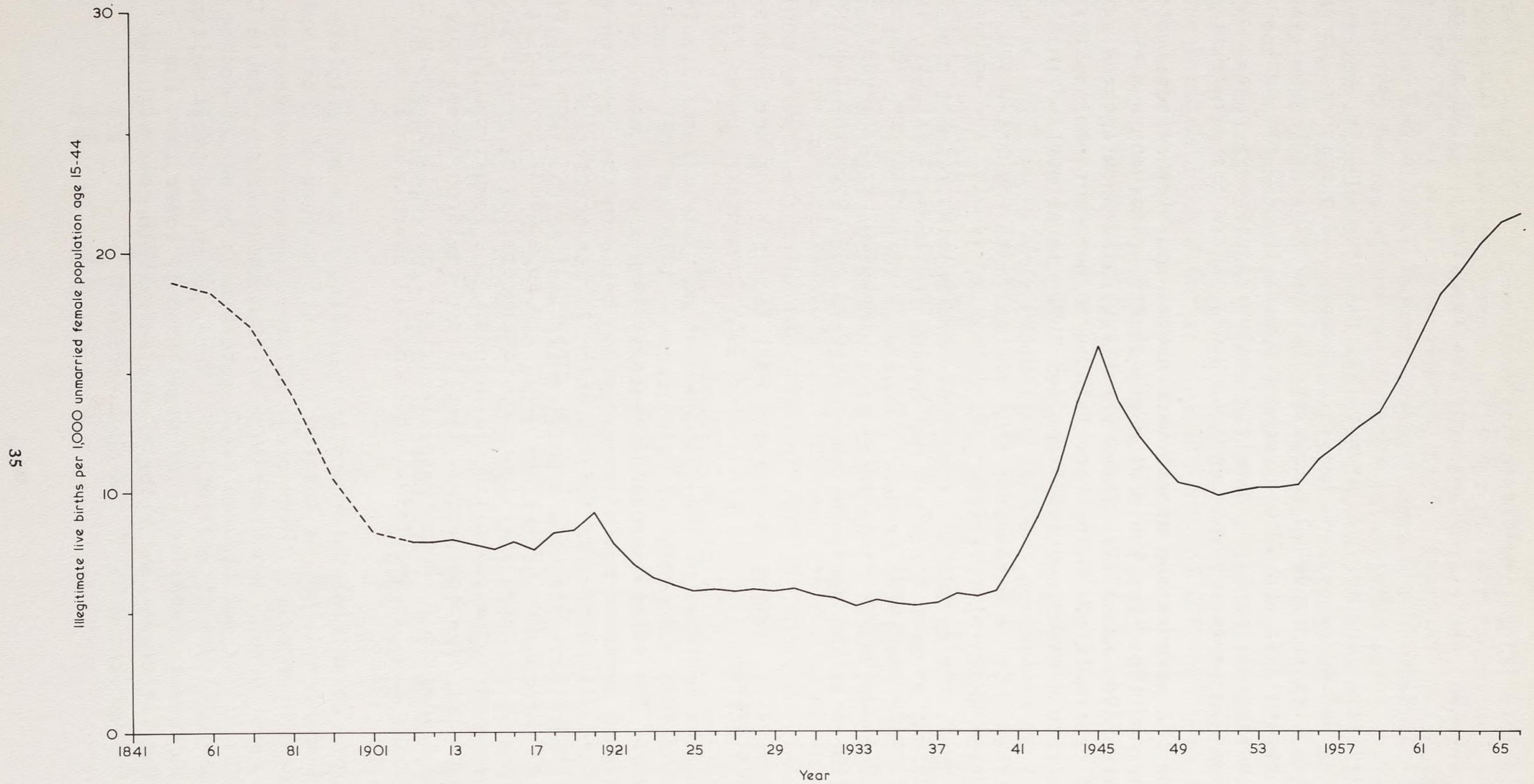
Measures of illegitimacy. The two measures of illegitimacy that we use are the illegitimacy rate as defined above and the illegitimacy ratio which is the number of illegitimate live births per 1,000 total live births. This ratio has risen by only 68 per cent between 1955 and 1966 as compared with the 109 per cent increase in the rate. The analytical problem associated with illegitimacy rates was discussed in the 1964 Commentary volume (pages 63-68), where the result of an investigation indicated that the conventional use of the single, widowed and divorced population of women as the appropriate denominator for illegitimate births could be misleading and that this would be particularly so for women over 25 years of age who generally have higher illegitimacy rates. This investigation revealed that nearly one illegitimate child in three might have been born to a married woman, or, at least, to a woman who would describe herself as married in a census.

On the other hand the illegitimacy ratio, useful as it is in judging the numerical impact of illegitimate babies on services provided for the newborn, has some shortcomings as an analytical tool. Two independent factors affect the numerator and denominator. The number of illegitimate births is affected by the size of the unmarried female population and the rate of illegitimacy, whereas the denominator, the total number of live births, is influenced by the factors that affect marital fertility, including changes in spacing and completed family size and the proportion of women who are married. The above limitations of the measures of illegitimacy should therefore be born in mind when using the figures published in the *Registrar General's Statistical Review*, Part II. For further discussion on illegitimacy see the following section and, also 1965 Commentary, pages 74-98 for the results of a generation study of illegitimate children.

Factors accounting for the increasing illegitimacy rate

With analytically deficient measures of illegitimacy, accounting for factors influencing illegitimacy can only be, at best, guesswork, rather than the product of cool, reasoned analysis. One factor that may help to account for the rising illegitimacy rate may be increasing reliance on contraceptives by people who would otherwise have avoided extra-marital relations. The result could only be an increase in the number of women having illegitimate children unless more marry before giving birth. Diagram 3 shows that illegitimacy may well be endemic: illegitimacy rates were high in the 1850s and then fell sharply until they started to rise in the 1940s.

Diagram 3



Illegitimate fertility rate 1841 to 1966, England and Wales

Multiple Births

In the period 1962-66, every 1,000 maternities resulted in 11.48 multiple births (one in every 87 maternities). This compared with 12.12 in 1957-61, 12.71 in 1951-56 and 12.66 in 1946-50 and continued the gradual fall in the ratio of multiple maternities to total maternities which began in the period 1957-61. In 1966 there were 9,418 twin maternities, 82 triplets, and 1 quadruplet maternity out of a total of 853,481 maternities. Details are given in Tables CC and DD of Part II of the Review. In the analyses which follow, the data have been grouped, as the number of multiple maternities in a single year is too small and too vulnerable to chance fluctuation for a detailed study. As the aggregates are not homogeneous, the standard errors of the averages are given in all calculations.

Table C16 shows the proportions of all maternities and births (total, live and still) which were multiple for the period mid-1938 to end-1945, and the five yearly periods between 1946 and 1966. These are illustrated in Diagram 4. Between 1951-56 and 1962-66, the multiple birth rate fell by 10 per cent whereas the multiple stillbirth rate (multiple stillbirths per 1,000 total stillbirths) fell by only 7 per cent thus continuing the high stillbirth risk in multiple as compared with single maternities. It is noteworthy that the multiple maternity rate was declining in the period when the fertility rate was generally rising. One possible reason for this is that, the incidence of multiple maternities reaches a peak at the age-group 35-39, but as many women are now having their children early in marriage, many would have completed or nearly completed their family by the time they reached the age-group 35-39. Thus there is a general decline in the number of women having children at the age-group when multiple maternity rates reach a peak.

Age of mother and legitimacy

Table C17 shows the analyses of the incidence of multiple maternities in the period mid-1938 to end-1945 and groups of years between 1946 and 1966 by age of mother and legitimacy. The rates increased regularly with age of mother up to age-group 35-39 and then declined again, an exception being in the location of the peak among illegitimate maternities in 1951-56 which is not statistically significant. The illegitimate rate was significantly smaller than the legitimate rate in 1938-45 only, throughout the periods being considered. The all-ages rate was very much affected by the different age distribution of the mothers; the illegitimate rate, 1962-66, standardised on the legitimate age distribution was significantly 'larger' than the legitimate rate and the same is true for all the other periods. For 1962-66, the illegitimate all-ages rate standardised on the legitimate age distribution was 13.31.

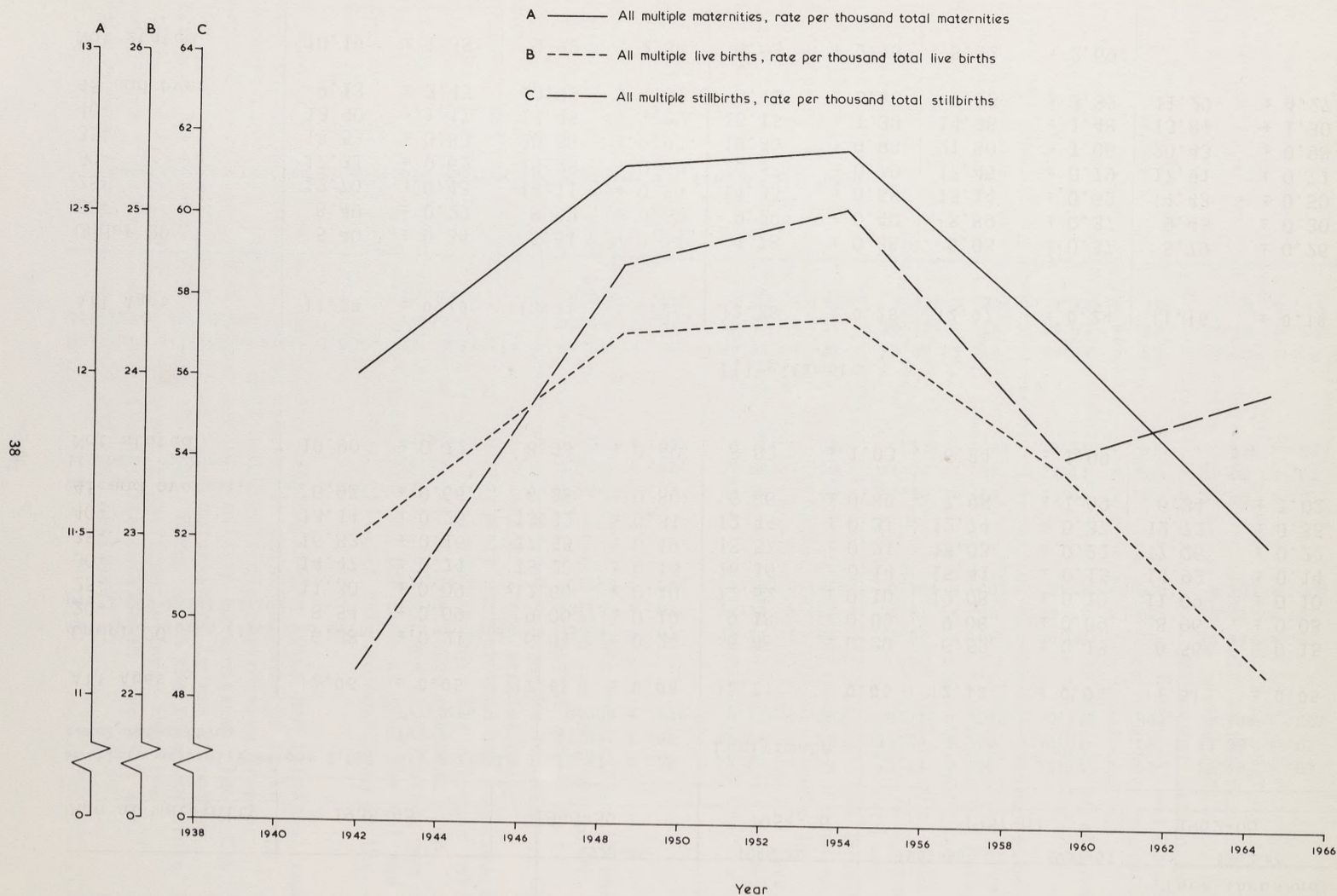
As usual the study of multiple births distinguishing twins and triplets from high order multiples which will not be treated in detail because of their very small numbers and their complexity. High order multiple maternities greater than three are very rare indeed, about one in a million maternities. Table C18 shows the triplet maternities per million total maternities by age of mother and legitimacy for periods 1938-61 and 1962-66. Here, as in the total multiple maternities, the illegitimate rates were not significantly lower than the legitimate rates. The legitimate and illegitimate rates both rose with age reaching a peak at the age-group 35-39 and then declined.

Table C16. Multiple birth proportions, 1938 to 1966, England and Wales

		1938-45	1946-50	1951-56	1957-61	1962-66
Multiple maternities* per 1,000 total maternities	All multiple	12.01 ± .05	12.66 ± .06	12.71 ± .06	12.12 ± .06	11.48 ± .05
	Twins	11.91 ± .05	12.54 ± .06	12.59 ± .06	12.01 ± .06	11.38 ± .05
	Triplets	0.100 ± .004	0.112 ± .005	0.116 ± .005	0.112 ± .005	0.104 ± .005
Multiple births (live and still) per 1,000 total births	All multiple	23.84 ± .07	25.11 ± .08	25.21 ± .08	24.06 ± .08	22.81 ± .07
	Twins	23.54 ± .07	24.77 ± .08	24.87 ± .08	23.73 ± .08	22.49 ± .07
	Triplets	0.295 ± .008	0.333 ± .009	0.344 ± .009	0.332 ± .009	0.309 ± .008
Multiple live births per 1,000 liveborn children	All multiple	23.00 ± .07	24.28 ± .08	24.39 ± .08	23.43 ± .08	22.25 ± .07
	Twins	22.72 ± .07	23.96 ± .08	24.06 ± .08	23.11 ± .08	21.95 ± .07
	Triplets	0.272 ± .007	0.311 ± .009	0.328 ± .009	0.316 ± .011	0.295 ± .008
Multiple stillbirths per 1,000 stillborn children	All multiple	48.75 ± .55	58.83 ± .78	60.24 ± .79	54.16 ± .82	55.82 ± .88
	Twins	47.74 ± .54	57.60 ± .77	59.21 ± .79	53.02 ± .81	54.70 ± .87
	Triplets	0.975 ± .077	1.207 ± .112	1.034 ± .104	1.145 ± .119	1.12 ± .12

* A maternity is treated as multiple whether the children are live or stillborn.

Diagram 4



Multiple birth proportions, 1938 to 1966, England and Wales

Table C17. Proportion of multiple maternities by age of mother and legitimacy 1938, to 1966, England and Wales

(per thousand)

Age at maternity	1938-45	1946-50	1951-56	1957-61	1962-66
Legitimate					
All Ages	12.06 ± 0.05	12.68 ± 0.06	12.71 ± 0.06	12.13 ± 0.06	11.51 ± 0.05
Under 20	6.38 ± 0.21	6.61 ± 0.24	6.48 ± 0.20	6.52 ± 0.18	6.56 ± 0.15
20-	8.54 ± 0.09	9.00 ± 0.10	9.18 ± 0.09	9.08 ± 0.09	8.96 ± 0.08
25-	11.30 ± 0.09	12.60 ± 0.10	12.52 ± 0.10	12.08 ± 0.10	11.69 ± 0.10
30-	14.47 ± 0.11	15.20 ± 0.14	16.16 ± 0.14	15.41 ± 0.15	14.92 ± 0.14
35-	16.83 ± 0.16	17.55 ± 0.19	18.57 ± 0.21	18.03 ± 0.22	17.26 ± 0.22
40-	13.14 ± 0.26	13.32 ± 0.31	12.45 ± 0.31	12.74 ± 0.37	12.72 ± 0.35
45 and over	6.97 ± 0.66	6.38 ± 0.80	6.86 ± 0.89	7.95 ± 1.09	6.34 ± 1.02
Not stated	10.90 ± 0.72	8.93 ± 0.89	8.82 ± 1.03	6.84 ± 1.09	-
Illegitimate					
All Ages	11.34 ± 0.19	12.31 ± 0.24	12.78 ± 0.25	12.07 ± 0.24	11.16 ± 0.19
Under 20	5.40 ± 0.34	5.51 ± 0.44	4.78 ± 0.38	6.03 ± 0.37	5.79 ± 0.26
20-	8.49 ± 0.29	8.92 ± 0.37	9.29 ± 0.40	8.89 ± 0.37	9.43 ± 0.30
25-	12.70 ± 0.43	14.11 ± 0.50	14.35 ± 0.58	15.14 ± 0.62	14.43 ± 0.50
30-	17.31 ± 0.62	16.25 ± 0.69	20.57 ± 0.79	17.46 ± 0.79	17.91 ± 0.71
35-	18.53 ± 0.83	20.68 ± 0.97	19.50 ± 0.98	21.80 ± 1.06	20.43 ± 0.98
40-	13.40 ± 1.17	13.45 ± 1.32	15.15 ± 1.38	14.38 ± 1.48	13.84 ± 1.30
45 and over	9.13 ± 3.45	10.03 ± 4.09	8.13 ± 3.63	7.63 ± 3.82	11.29 ± 4.27
Not stated	10.19 ± 1.55	9.92 ± 2.34	6.03 ± 2.13	8.52 ± 2.69	-

Table C18. Triplet maternities per million total maternities by age of mother and legitimacy, 1938-61, 1962-66, England and Wales

Age at maternity	1938-61			1962-66		
	Total	Legitimate	Illegitimate	Total	Legitimate	Illegitimate
All ages	110 ± 3	110 ± 3	102 ± 11	104 ± 5	105 ± 5	99 ± 18
Under 20	46 ± 8	51 ± 9	26 ± 13	39 ± 10	43 ± 12	23 ± 16
20-	63 ± 4	64 ± 4	58 ± 14	63 ± 7	61 ± 7	79 ± 28
25-	96 ± 4	95 ± 4	117 ± 24	96 ± 9	94 ± 9	136 ± 48
30-	150 ± 6	149 ± 7	164 ± 34	185 ± 16	183 ± 16	227 ± 80
35-	200 ± 10	199 ± 10	237 ± 52	187 ± 23	187 ± 23	188 ± 94
40-	126 ± 15	126 ± 15	125 ± 63	128 ± 34	128 ± 36	121 ± 121
45 and over	91 ± 45	96 ± 48	-	-	-	-
Not stated	109 ± 45	108 ± 48	117 ± 117	-	-	-

Data obtained at birth registration do not permit a conclusion on the zygosity of twins, which can be derived only from medical examinations. Examination of the foetal membranes and placentae at birth or serological examination of the twin individuals could lead to a more precise means of identifying mono and dizygotic twins. However, a method of estimating the relative numbers of monozygotic and dizygotic twins is based on the expectation that among dizygotic twins, pairs of unlike and of like sex should occur with equal frequency while monozygotic twins will all be in pairs of like sex. Thus if we subtract the number of unlike sex pairs from the number of like sex pairs the difference represents approximately the number of monozygotic pairs while the number of dizygotic pairs is twice the number of unlike sex pairs. This relationship is only approximately true because the ratio of male to female is slightly greater than one to one.

Stillbirth rates in twins

The stillbirth rates in twin pairs, classified as monozygotic and dizygotic twins are shown in Tables C19 and C20. The correlation between twins as regards survival is high and can be obtained from the fourfold tables.

There is a high correlation for monozygotic twin pairs where 1,111 out of 15,472 or 7.18 per cent fell into the middle group, 'one surviving, one not surviving', compared with 1,492 out of 33,492 or 4.45 per cent for the dizygotic twins. The stillbirth rate was high in twins compared with that for single births, for monozygotic twins it was 21.6 per 1,000 total twin individuals, 18.6 for dizygotic twins while it was only 16.0 per 1,000 total single births.

Table C19. Survival in monozygotic and dizygotic twin pairs, 1962-66, England and Wales

Type	Both twins surviving	One twin stillborn	Both twins stillborn	Total pairs
Monozygotic	13,857	1,111	504	15,472
Dizygotic	31,834	1,492	166	33,492
Total	45,691	2,603	670	48,964

Table C20. Survival in monozygotic and dizygotic twin individuals, 1962-66, England and Wales

Monozygotic				Dizygotic		
Surviving twin	Stillborn twin	Total individuals		Surviving twin	Stillborn twin	Total individuals
27,714	1,111	28,825	with surviving twin	63,668	1,492	65,160
1,111	1,008	2,119	with stillborn twin	1,492	332	1,824
28,825	2,119	30,944	Total	65,160	1,824	66,984

Monozygotic twins. The monozygotic and dizygotic twinning rates are shown in Table C21. Throughout the period covered the trend of legitimate rates rising very slightly with mother's age was maintained. As it has been observed in a previous report (1961 Commentary*) the slight rise of legitimate rates with age of mother may not be attributable to a direct influence of mother's age, rather, it might be that father's age is the direct cause of this variation appearing here because of the correlation between parent's ages. The rise again is just about significant during the period 1962-66 although in the periods 1957-61 and 1946-50 they were not; however, the rise was significant during the periods 1938-45 and 1951-56.

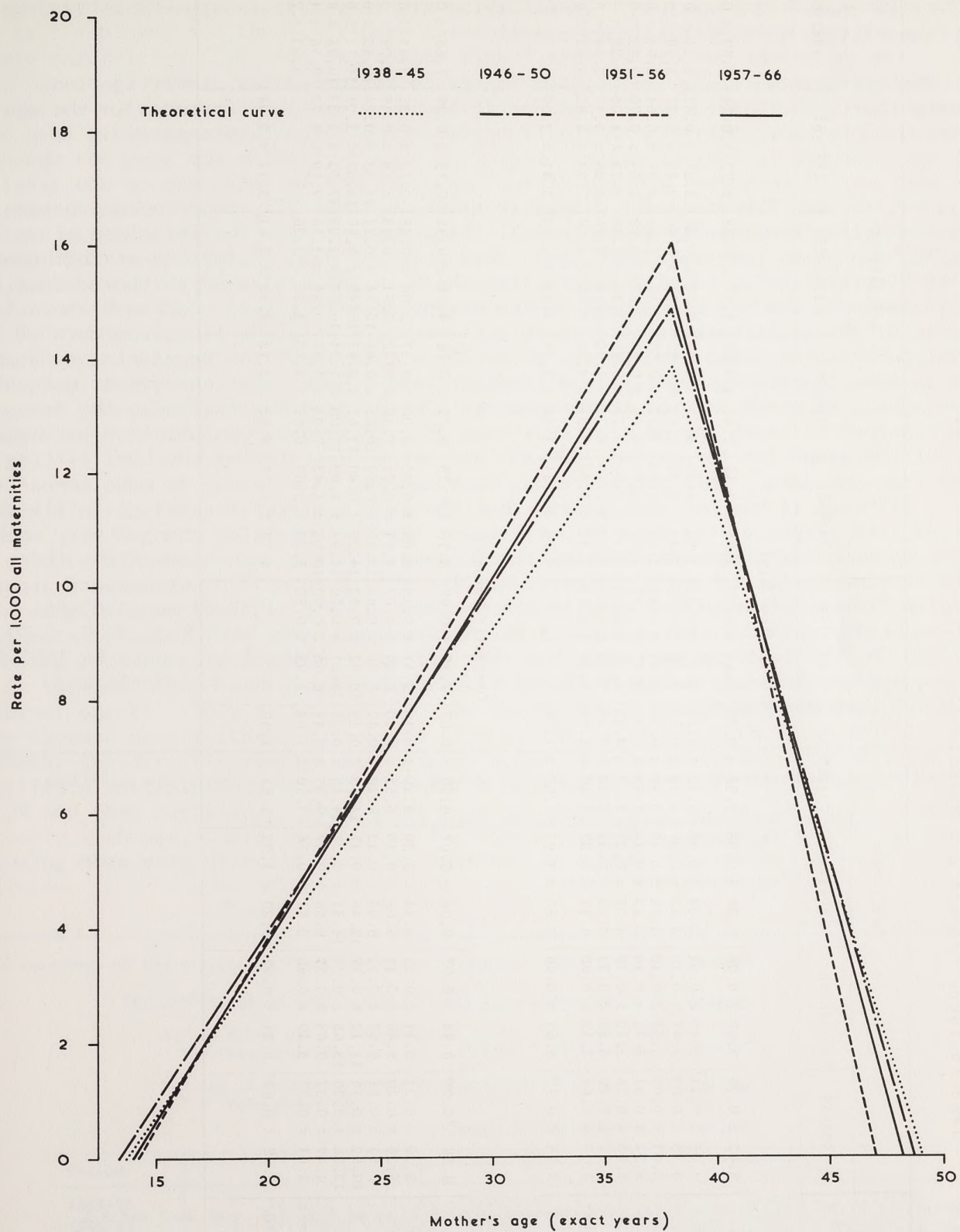
*The Registrar General's Statistical Review of England and Wales for the year 1961, Part III, Commentary (page 91).

Period	F with 1 and 5 degrees of freedom	P
1938-45	25.06	less than 0.01
1946-50	3.24	0.1
1951-56	16.23	0.01
1957-61	1.31	more than 0.2
1962-66	6.39	less than 0.05

Table C21. Twin maternities per 1,000 total maternities by type, age of mother and legitimacy, 1938 to 1966, England and Wales

Age at Maternity	Legitimate					Illegitimate				
	1938-45	1946-50	1951-56	1957-61	1962-66	1938-45	1946-50	1951-56	1957-61	1962-66
Monozygotic Twins										
All ages	3.42 ± 0.05	3.62 ± 0.06	3.54 ± 0.06	3.52 ± 0.06	3.61 ± 0.03	3.06 ± 0.19	3.46 ± 0.24	3.47 ± 0.25	3.23 ± 0.24	3.40 ± 0.10
Under 20	3.05 ± 0.21	3.46 ± 0.24	3.24 ± 0.20	3.19 ± 0.15	3.35 ± 0.11	3.32 ± 0.34	3.51 ± 0.44	2.72 ± 0.38	3.27 ± 0.37	3.34 ± 0.19
20-	3.23 ± 0.09	3.47 ± 0.10	3.42 ± 0.09	3.52 ± 0.09	3.49 ± 0.05	3.48 ± 0.29	2.82 ± 0.37	3.71 ± 0.40	2.45 ± 0.37	3.28 ± 0.18
25-	3.31 ± 0.09	3.52 ± 0.10	3.48 ± 0.10	3.58 ± 0.10	3.69 ± 0.05	2.53 ± 0.43	3.32 ± 0.50	3.52 ± 0.58	3.97 ± 0.61	3.94 ± 0.26
30-	3.51 ± 0.11	3.92 ± 0.14	3.58 ± 0.14	3.50 ± 0.15	3.81 ± 0.07	2.89 ± 0.62	4.49 ± 0.69	3.87 ± 0.78	2.84 ± 0.79	2.98 ± 0.29
35-	3.86 ± 0.16	3.72 ± 0.19	4.05 ± 0.21	3.63 ± 0.22	3.47 ± 0.10	2.44 ± 0.83	3.32 ± 0.96	2.38 ± 0.98	4.23 ± 1.05	3.25 ± 0.39
40-	3.55 ± 0.26	3.58 ± 0.31	3.72 ± 0.31	3.22 ± 0.36	3.93 ± 0.20	3.17 ± 1.16	6.21 ± 1.32	5.81 ± 1.38	4.28 ± 1.47	3.64 ± 0.66
45 and over	4.29 ± 0.66	3.19 ± 0.80	4.11 ± 0.87	4.20 ± 1.08	4.39 ± 0.84	3.91 ± 3.46	3.34 ± 4.10	4.88 ± 3.64	7.63 ± 3.82	8.06 ± 3.60
Not stated	3.78 ± 0.72	3.63 ± 0.89	2.50 ± 1.02	1.05 ± 1.08		3.79 ± 1.54	1.10 ± 2.34	1.51 ± 2.13	3.41 ± 2.69	
Dizygotic Twins										
All ages	8.54 ± 0.06	8.94 ± 0.07	9.04 ± 0.07	8.50 ± 0.07	7.79 ± 0.04	8.18 ± 0.23	8.75 ± 0.28	9.21 ± 0.31	8.73 ± 0.29	7.66 ± 0.16
Under 20	3.30 ± 0.21	3.11 ± 0.25	3.14 ± 0.20	3.29 ± 0.18	3.17 ± 0.10	2.04 ± 0.30	2.00 ± 0.37	2.06 ± 0.35	2.72 ± 0.35	2.41 ± 0.17
20-	5.26 ± 0.10	5.46 ± 0.11	5.68 ± 0.10	5.51 ± 0.10	5.40 ± 0.07	4.91 ± 0.31	6.10 ± 0.43	5.51 ± 0.43	6.38 ± 0.45	6.08 ± 0.24
25-	7.91 ± 0.11	8.97 ± 0.12	8.94 ± 0.12	8.39 ± 0.12	7.90 ± 0.08	10.10 ± 0.55	10.61 ± 0.61	10.74 ± 0.71	11.05 ± 0.74	10.35 ± 0.42
30-	10.82 ± 0.14	11.12 ± 0.17	12.40 ± 0.17	11.76 ± 0.18	10.92 ± 0.12	14.29 ± 0.80	11.67 ± 0.83	16.49 ± 0.99	14.37 ± 1.01	14.71 ± 0.65
35-	12.79 ± 0.20	13.65 ± 0.24	14.31 ± 0.27	14.16 ± 0.28	13.61 ± 0.20	15.97 ± 1.09	17.00 ± 1.24	16.87 ± 1.29	17.32 ± 1.33	16.95 ± 0.89
40-	9.47 ± 0.31	9.63 ± 0.37	8.58 ± 0.37	9.35 ± 0.44	8.66 ± 0.29	10.02 ± 1.43	7.24 ± 1.37	9.34 ± 1.54	9.79 ± 1.73	9.96 ± 1.10
45 and over	2.61 ± 0.57	3.19 ± 0.80	2.51 ± 0.76	3.60 ± 1.04	1.95 ± 0.56	5.22 ± 3.69	6.69 ± 4.73	3.25 ± 3.26	-	3.23 ± 2.28
Not stated	6.98 ± 0.82	5.31 ± 0.97	6.20 ± 1.22	5.61 ± 1.40		6.16 ± 1.71	8.82 ± 3.12	4.52 ± 2.61	5.11 ± 2.94	

Diagram 5



Legitimate dizygotic twin maternities per 1,000 total maternities by age of mother at birth, 1938 to 1966, England and Wales

The illegitimate rates are based on much smaller numbers and are therefore subject to chance fluctuations; in no period did they deviate significantly from the lines fitted to the legitimate rates*.

The differences among the periods cannot be accounted for, investigation showing that the differences are not due to the very small differences in the age-distribution of maternities with the five-year groups of mother's age.

Dizygotic twins. The rates for dizygotic twins in Table C21, read in conjunction with the multiple maternity rates in Table C17, suggest that the incidence of multiple ovulation increases with age. This point of view is further strengthened by the distribution of triplet maternities shown in Table C18, which shows a similar relationship to the age of mothers as the dizygotic twin rates. As can be seen from Diagram 5, the legitimate rates rise in a practically straight line from zero at the age of puberty to a point in the age group 35-39, very near to the exact age 38 and then decline sharply apparently in a straight line (there is a scarcity of data at these ages), to reach zero at the menopause. In the previous analyses, the data were designed to reach the peak at exact age 38. This point was obtained by inspection of the graph for the period 1938-45, and not by calculating the best fitting point from the data. This procedure has been adhered to in order to make comparison easy. Although it has not been proved that the peak was at the same age in all the periods, the graphs of the data do not suggest that its position changed very much. Again, as is evident when considering the monozygotic twin maternity rates, there has been some variation among the periods. The actual rates did not deviate significantly from the theoretical ones in the periods 1938-45, 1957-61 and 1962-66 (chi-squared with 4 d.f. being 5.63, 4.00, 4.82 respectively with $P \approx 0.20, 0.50 > P > 0.30$ for the last two periods), but they did so in 1946-50 and again in 1951-56 (chi-squared with 4 d.f. being 29.56 and 11.64 respectively and $P < 0.001$ and $P = 0.02$) (see Diagram 5).

*The equations of the regression lines for the periods covered since this analysis began are as follows:

Let y = legitimate monozygotic twin maternity rate per 1,000 total legitimate maternities

x = age at maternity in years

Then:-

$$1938-45 \quad y = 2.4391 + 0.0334x$$

$$1946-50 \quad y = 3.0757 + 0.0184x$$

$$1951-56 \quad y = 2.7486 + 0.0279x$$

$$1957-61 \quad y = 3.2853 + 0.0279x$$

$$1962-66 \quad y = 3.0146 + 0.0218x$$

The deviations of the illegitimate rates give chi-squared with 7d.f. of 8.9, 8.5, 6.8, 10.7 and 3.5 respectively ($P > 0.1$ throughout).

In 1962-66, the number of illegitimate dizygotic maternities was small, about 8 per cent of the number of legitimate maternities. This smallness in number makes the test employed for the legitimate maternities not strictly valid for the illegitimate maternities (i.e. the regression lines* were fitted and tested by an application of normal regression theory as developed by S. S. Wilkes in *Mathematical Statistics* - Princeton University Press, 1944, Chp. VIII). The theoretical lines have been given a peak at age 38 (Diagram 6) like those for the legitimate rates although the peak may actually have occurred at a slightly earlier or later age for at least one or the other of the periods; but it has not been possible to test this. The variation among the periods is again noticeable. The actual rates did not deviate significantly from the theoretical lines in 1938-45 and 1951-56 (chi-squared = 6.02, 6.30 respectively with 4 d.f. and $P > 0.10$) and were very close in 1957-61 and 1962-66 (chi-squared = 0.88, 1.19 respectively with 4 d.f., $P > 0.80$). The deviations were however significant between 1946-50 (chi-squared = 15.02 with 4 d.f., $P < 0.01$) but less so compared with the legitimate rates where the number of maternities was much larger. There were significant differences between the legitimate and illegitimate rates for some periods. The shape of the illegitimate regression line was generally steeper than that of the legitimate and at the peak age-group the illegitimate rates were much higher.

Parity distribution of legitimate multiple births

Table C22 shows the distribution of legitimate all multiple, monozygotic and dizygotic twin maternities per 1,000 legitimate maternities for the years 1963-66, according to age of mother and the number of previous live born children. The incidence of multiple maternities varies with age as discussed above, and also directly with increased order of parity, but a closer look at Table C22 shows that it is the incidence of dizygotic maternities that really varies with the increased order of parity. This variation with the parity order could be accounted for in part because parity itself varies, to some extent, directly with age. For the young mothers, the direct variation with parity order is also observable for all the legitimate multiple maternities reaching a peak at birth order 4, for mothers aged 20-24 and then declining. Thus apart from the distortion caused by parity varying directly with age, there is evidence to suppose that the incidence of dizygotic twinning does vary directly with the increase in number of previous live born children.

*The equations of the regression lines for the five periods are as follows:

Let y = dizygotic twin maternity rate per 1,000 total maternities

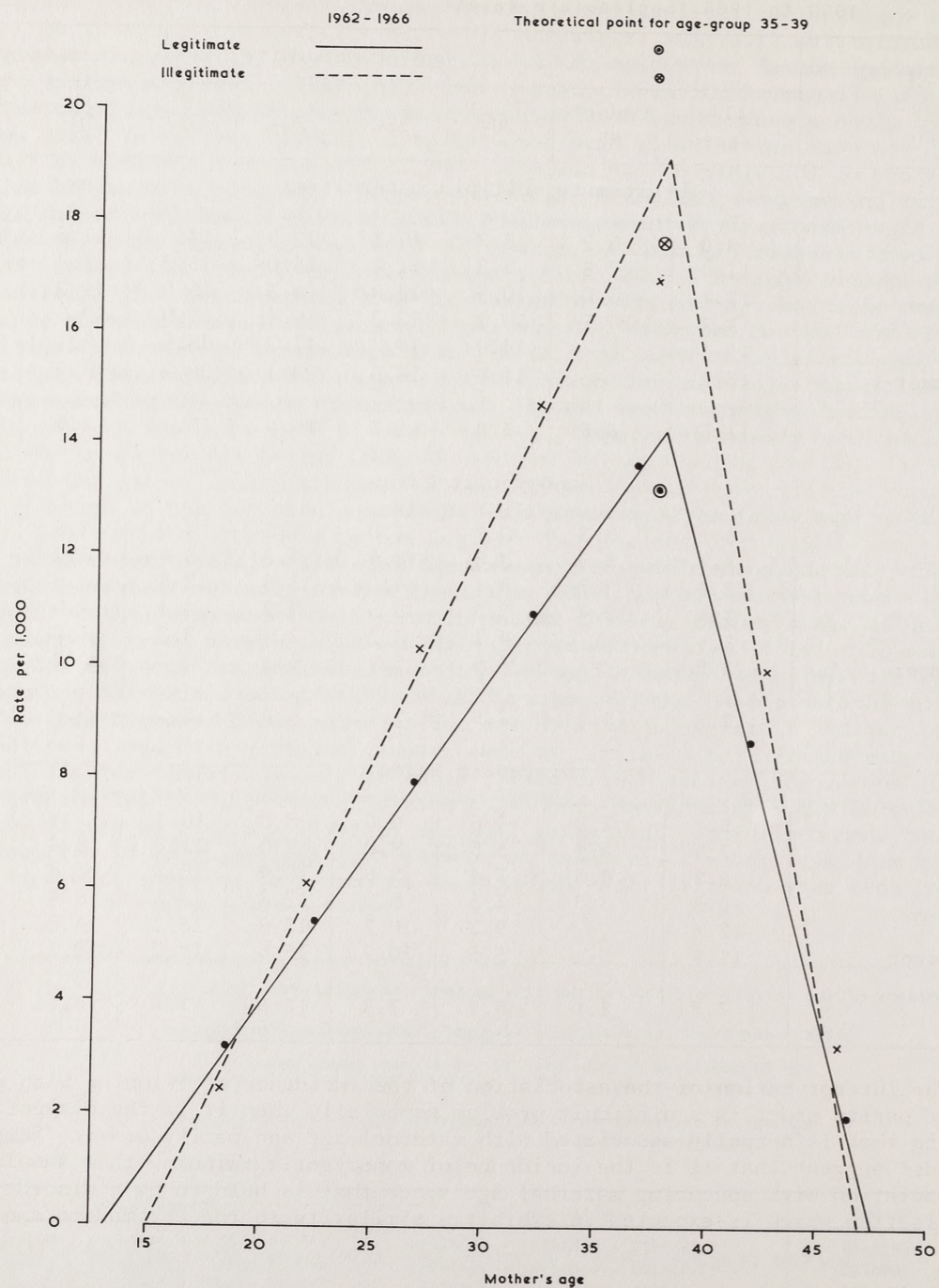
x_1 = 38 minus age at maternity in years (ages under 38),
= 0 (ages over 38).

x_2 = age at maternity minus 38 (ages over 38),
= 0 (ages under 38).

Then:-

Period	Legitimate	Illegitimate
1938-45	$y = 13.9472 - 0.5695x_1 - 1.2832x_2$	$y = 18.4140 - 0.8440x_1 - 1.9414x_2$
1946-50	$y = 14.9509 - 0.6140x_1 - 1.4199x_2$	$y = 17.9326 - 0.7931x_1 - 2.4015x_2$
1951-56	$y = 16.0016 - 0.6740x_1 - 1.7921x_2$	$y = 20.2126 - 0.9264x_1 - 2.4624x_2$
1957-61	$y = 15.2017 - 0.6313x_1 - 1.4843x_2$	$y = 19.5085 - 0.8429x_1 - 2.5498x_2$
1962-66	$y = 14.2559 - 0.5805x_1 - 1.4804x_2$	$y = 19.1849 - 0.8405x_1 - 2.1723x_2$

Diagram 6



Comparison of legitimate and illegitimate dizygotic twin maternity rates

Table C22. Legitimate multiple maternities, monozygotic and dizygotic twins by age and parity of mother. Rates per 1,000 legitimate maternities, 1963 to 1966, England and Wales

Number of previous children	Age at maternity							
	All ages	Under 20	20-	25-	30-	35-	40-	45 and over
Legitimate multiple maternities								
0	9.0	6.2	8.3	10.1	12.9	14.5	11.6	3.4
1	11.2	7.8	9.3	11.4	14.0	15.3	11.8	10.1
2	13.1	8.0	10.5	12.8	14.3	16.0	11.2	11.6
3	14.7	20.7	10.2	13.3	16.4	17.9	12.6	7.1
4	16.1	-	14.0	14.0	17.3	18.9	13.1	2.9
5 and over	18.2	-	11.0	14.5	20.1	20.7	13.9	5.5
Total	11.5	6.6	9.0	11.7	15.0	17.1	12.5	6.7
Monozygotic twins								
0	3.8	3.3	3.7	4.0	4.5	4.0	4.6	-
1	3.6	3.3	3.6	3.4	4.2	3.4	3.1	10.1
2	3.6	3.7	3.1	4.0	3.8	2.5	5.4	6.5
3	3.6	12.4	2.6	3.3	3.9	4.1	4.0	4.7
4	3.4	-	4.1	3.2	3.3	3.3	4.2	1.5
5 and over	3.5	-	5.5	3.7	4.3	2.3	3.7	5.5
Total	3.6	3.4	3.6	3.7	4.0	3.2	4.1	5.1
Dizygotic twins								
0	5.1	2.8	4.6	6.0	8.3	10.3	7.1	3.4
1	7.5	4.4	5.6	8.0	9.6	11.7	8.4	-
2	9.3	4.3	7.4	8.8	10.4	13.3	5.8	5.2
3	10.9	8.3	7.5	9.9	12.3	13.5	8.4	2.4
4	12.6	-	9.7	10.7	13.8	15.3	8.8	1.5
5 and over	14.5	-	5.5	10.7	15.6	18.2	10.1	-
Total	7.7	3.1	5.3	7.9	10.8	13.7	8.3	1.6

The interpretation of the association of the incidence of twinning with maternal age and parity order is a difficult problem especially when it is the dizygotic twinning that is actually associated with maternal age and parity order. Some opinions* suggest that it is the incidence of monozygotic twinning that should show an association with advancing maternal age since that is held to be a disorder of fertilisation which is expected to exhibit a similarity to the chromosome anomalies

*Annual Report of the Registrar General for Scotland, 1964.

which are commonly associated with advancing maternal age, while other opinions would postulate the incidence of twinning not as a disorder of fertilisation, but as due to age changes in the uterine mucosa and failure of the usual anti-nidation mechanism which prevents multiple births in most women. The statistical evidence in Table C22, however, shows that the incidence of monozygotic twins occurred uniformly at the rate of $3.6 + 0.23$ per 1,000 total maternities throughout all the parity orders for all age-groups.

Earlier* studies have shown that dizygotic twinning is more common among the maternities of women who were themselves dizygotic twins although not among the offspring of twin fathers. The incidence of monozygotic twins could therefore be regarded as a random event, whose frequency of occurrence is measurable, in the course of child bearing.

On the other hand, the association between the incidence of dizygotic twins, maternal age and parity order may be due to the irregularities of menstrual cycles. As age advances, the length of period of menstrual cycles become irregular and this increases the chances of two proximate ovulations and consequently dizygotic twins, but the fact that there is a drop after the peak has been reached at the age group 35-39 makes this an extremely difficult hypothesis to prove. Perhaps, in addition, the association with parity order may be an indication that incidence of dizygotic twinning has something to do with fertility.

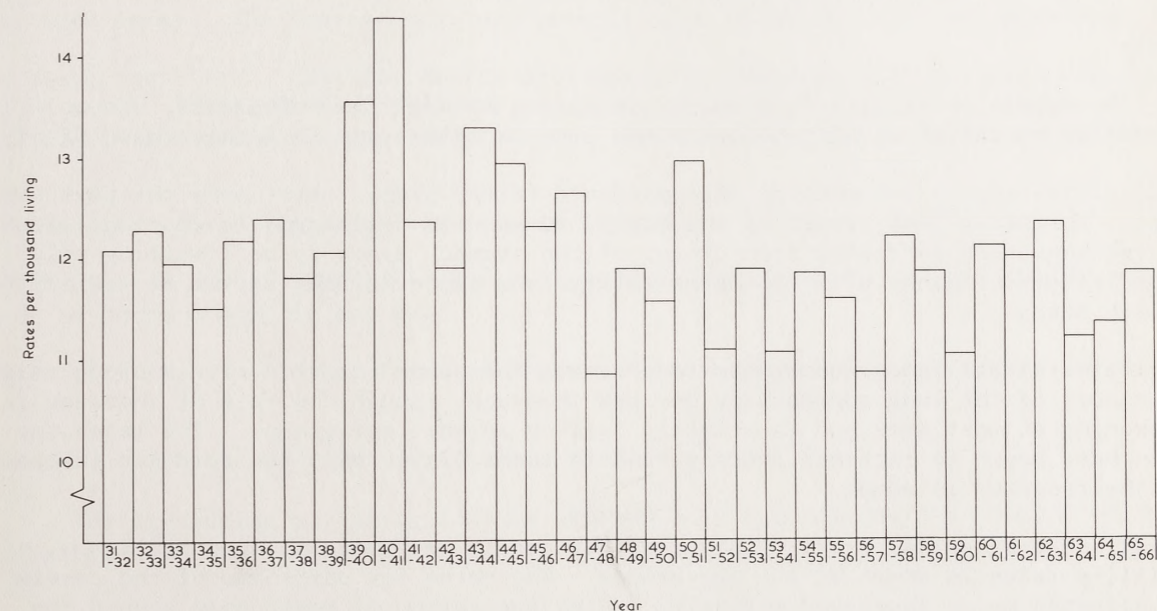
*Annual Report of the Registrar General for Scotland, 1964.

GENERAL MORTALITY

In 1966 there were 563,624 deaths registered in England and Wales; 288,622 males and 275,002 females. The crude death rate per thousand living was 11.7 for all persons, 12.3 for males and 11.1 for females. These figures are 2 per cent higher than the comparable rates for 1965, but are very close to the averages of the last twenty annual rates.

Because the crude mortality rates depend so much on the severity of the winter, averaging over the calendar year tends to smooth out the seasonal variation, which is brought out rather more clearly by averaging the four quarterly rates beginning with the September quarter instead of the March quarter (Diagram 7).

Diagram 7



Death rates per thousand living from all causes, mid-1931 to mid-1966, England and Wales

The Standardised Mortality Ratios based on the experience of 1950-52, rose slightly from 93 to 94 for males and from 83 to 85 for females. As might be expected, the increased seasonal fluctuation is reflected chiefly by increases in the rates for respiratory infections, especially influenza and broncho-pneumonia, the excess is also seen in some forms of cancer, and in chronic debilitating

diseases such as arteriosclerosis and arthritis. The age-groups most affected are the 65 years and over in both sexes. In males there is also a slight increase in the 1-4 year-olds, and a continuation of the upward trend in the 15-19 age-group. In females the 45-49 age-group shows an increase. Infant mortality rates remained unchanged in both sexes at 21 per 1,000 live births for males and 16 per 1,000 for females.

Mortality from tuberculosis

The age-specific death rates from tuberculosis have flattened out at most ages in both sexes. Only persons aged 35-44 and males aged 65-74 show continued falls in rates over the past four years. Mortality is greater for males than for females at all ages.

Syphilis

Mortality from syphilis has remained steady for the past few years at most ages in males, and at all ages in females. Deaths from congenital syphilis still occasionally occur, and there is a rising trend in the mortality from luetic aortic aneurysm in the last three years in males aged 75-84.

Cancer

The overall mortality from cancer is rising steadily in both sexes, due to increasing mortality at ages 65 years and over in males, and in females aged 65-74.

Gastro-intestinal tract cancers have produced fairly stable rates over the past few years. Mortality from cancer of the mouth, tongue and oesophagus is constant, and the falling trend in deaths from cancer of the stomach seems to be levelling out. There is some evidence of a rising mortality from cancer of the rectum at ages 55-64 in both sexes.

Respiratory tract cancer continues to dominate the scene in males with a crude rate for cancer of the lung approaching one per thousand, though the rate of increase is slackening at most ages and is actually falling in some age-groups. The rates for women have begun to increase sharply, and it seems likely that the epidemic in men will be repeated in women.

Breast and uro-genital tract. Cancer of the breast is producing very stable mortality rates in women of all age-groups. The rates for carcinoma of the cervix are affected by an increased mortality in the generation of women born around the time of the First World War, rates for other uterine cancer are unchanging. The crude rate for cancer of the ovary, Fallopian tube and broad ligament, has been increasing steadily for the past twenty years, and not all the increase is due to ageing of the population since the SMR is also increasing. Examination of the age-specific rates shows that the increases are only in women aged 65 years and over, the rates for the younger age-groups showing decreases.

Mortality from cancer of the prostate remains unchanged. The SMR for carcinoma of the kidney is rising in both sexes, with increasing rates at ages 55-64 in both

men and women. Mortality from malignant neoplasm of the bladder and other urinary organs is rising in men but not in women. The increased risk seems to be at ages 65-74.

Other sites. The SMRs for malignant melanoma of the skin are increasing in both sexes, but the numbers are small so that interpretation is difficult. The middle age-groups seem to be most affected.

Lymphatic and haematopoietic malignancy. The rising SMRs in both sexes over the past few years for malignant neoplasms in these categories are due to increasing mortality from lymphosarcoma, reticulosarcoma, and myeloma in the older age-groups. The rates for Hodgkin's disease and for leukaemia are stationary.

Allergic, endocrine system, metabolic and nutritional diseases

Asthma. The rising mortality from asthma has been much discussed recently. The upward trends are seen in both sexes and at most ages, but are more clearly marked in school children and young adults. The cause of this phenomenon has still to be found.

Thyroid disease. Mortality from disease of the thyroid gland is declining gradually in both sexes. The improvements are seen in both thyrotoxicosis and myxoedema.

Diabetes mellitus. SMRs for deaths attributed to diabetes mellitus are rising in both sexes. The increases result from rising rates in the older age-groups and may be due to changes in diagnostic practice. The rates in young people are stationary.

Diseases of the blood and blood-forming organs

Pernicious anaemia. SMRs for this cause are falling in both sexes. The decreases are in persons aged 65 and over.

Iron deficiency and other forms of anaemia contribute a fairly steady mortality.

Mental, psychoneurotic and personality disorders

The increasing mortality in this section is due to increasing numbers of deaths attributed to senile psychosis.

Diseases of the central nervous system

Vascular lesions of the central nervous system. The gentle decline in the SMR for strokes in both sexes is due to reduced mortality in persons aged 65-74. The improvement is in death attributed to cerebral haemorrhage, cerebral thrombosis and cerebral embolism. Mortality from subarachnoid haemorrhage is constant.

Inflammatory and other diseases of the central nervous system. Mortality rates for diseases in this section, in particular multiple sclerosis, paralysis agitans and motor neurone disease are stationary.

Diseases of the circulatory system

Chronic rheumatic heart disease. The SMRs for chronic rheumatic heart disease continue to fall steadily. The decreases in age-specific rates are seen more consistently in mortality attributed to mitral rather than aortic valvular involvement, and are proportionately steeper at younger ages, but equal for males and females.

Arteriosclerotic and degenerative heart disease. The SMRs for all the diseases in this group are very nearly flat, with a slight upward trend in males. However, some of the age-specific rates show more definite increases, e.g. males aged 35-44 and females aged 45-54. These changes are seen more clearly in the rates for ICD No. 420, arteriosclerotic heart disease, including coronary disease. Some of these increases can be explained by a transfer of diagnosis from ICD categories 421 and 422 where the rates are declining.

Hypertensive heart disease and other hypertensive disease. Mortality in both these categories is falling steadily at all ages. This means that doctors are mentioning hypertension less as the underlying cause of death from coronary artery disease, left heart failure, etc. How far this is an accurate reflection of the modern treatment of hypertension is speculative.

Diseases of arteries. The SMRs for arterial disease have risen very gradually over the past ten years. Mortality from non-luetic aortic aneurysm is constant at all ages.

Diseases of veins. Mortality from venous embolism and thrombosis is rising gradually in both sexes. Whilst the rise in males is seen only in the elderly, in females there is also a sharp increase, particularly in the last two or three years, in the rates for women of reproductive age. This could be due to the introduction of hormonal contraceptives, or changes in diagnostic tendencies due to the postulated causal connection.

Diseases of the respiratory system

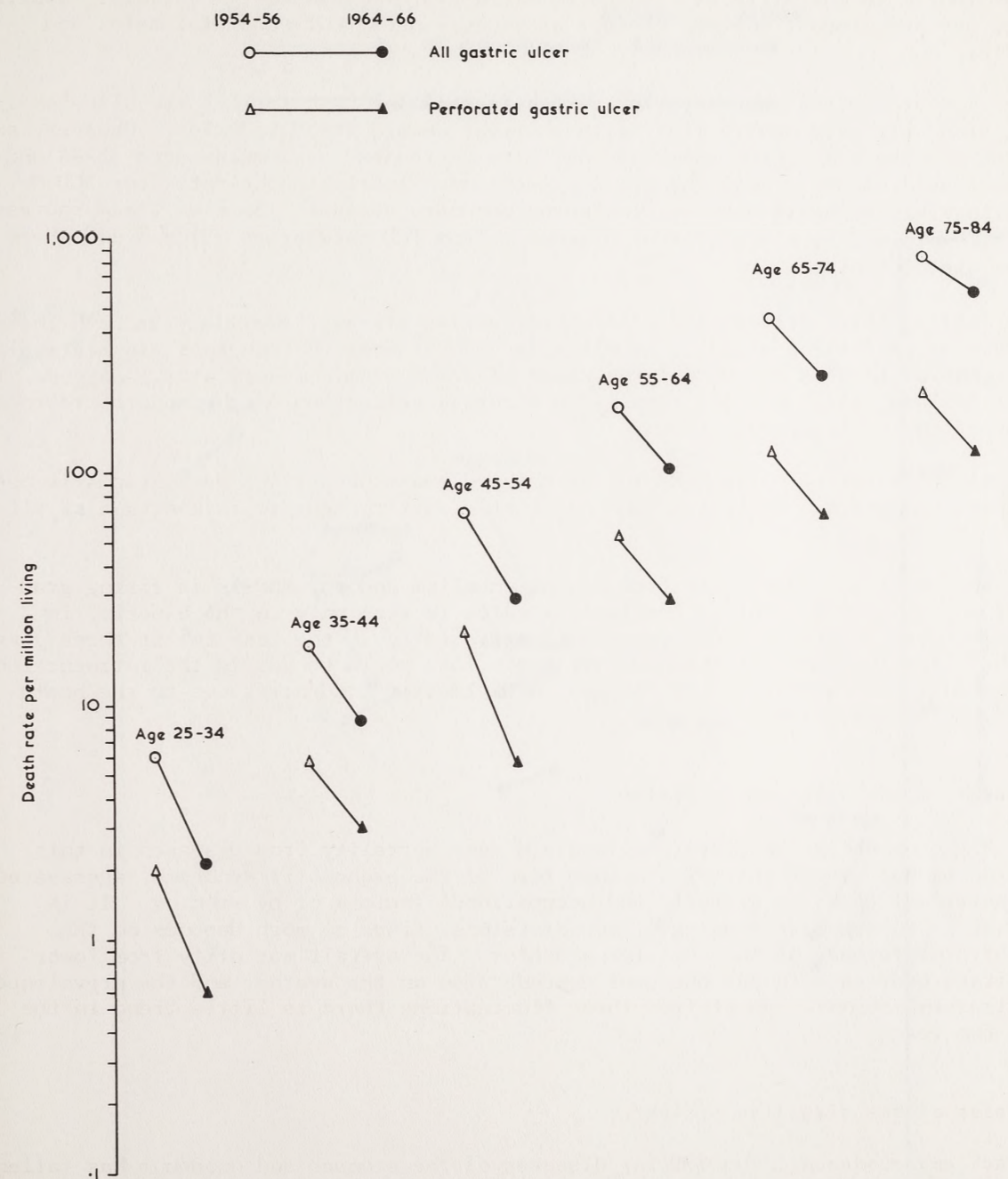
With the exception of infancy and old age, mortality from diseases in this section is due almost entirely to some form of the bronchitis syndrome, aggravated in individual cases by climatic and occupational factors or by smoking. It is impossible to separate meaningful sub-divisions, since so much depends on the semantic preference of the certifying doctor. The overall mortality from lower respiratory disease in any one year depends also on the weather and the prevalence of virus infections. Apart from these fluctuations there is little trend in the past ten years.

Diseases of the digestive system

Stomach and duodenum. The SMR for diseases of the stomach and duodenum has fallen steadily since 1951 in males, and since 1955 in females. The decreases are due to reduced mortality from peptic ulcer, both gastric and duodenal, at all ages, though more marked at younger ages (Diagrams 8a, 8b, 9a and 9b). The reduction in

Diagram 8a

Males 1954-56, 1964-66

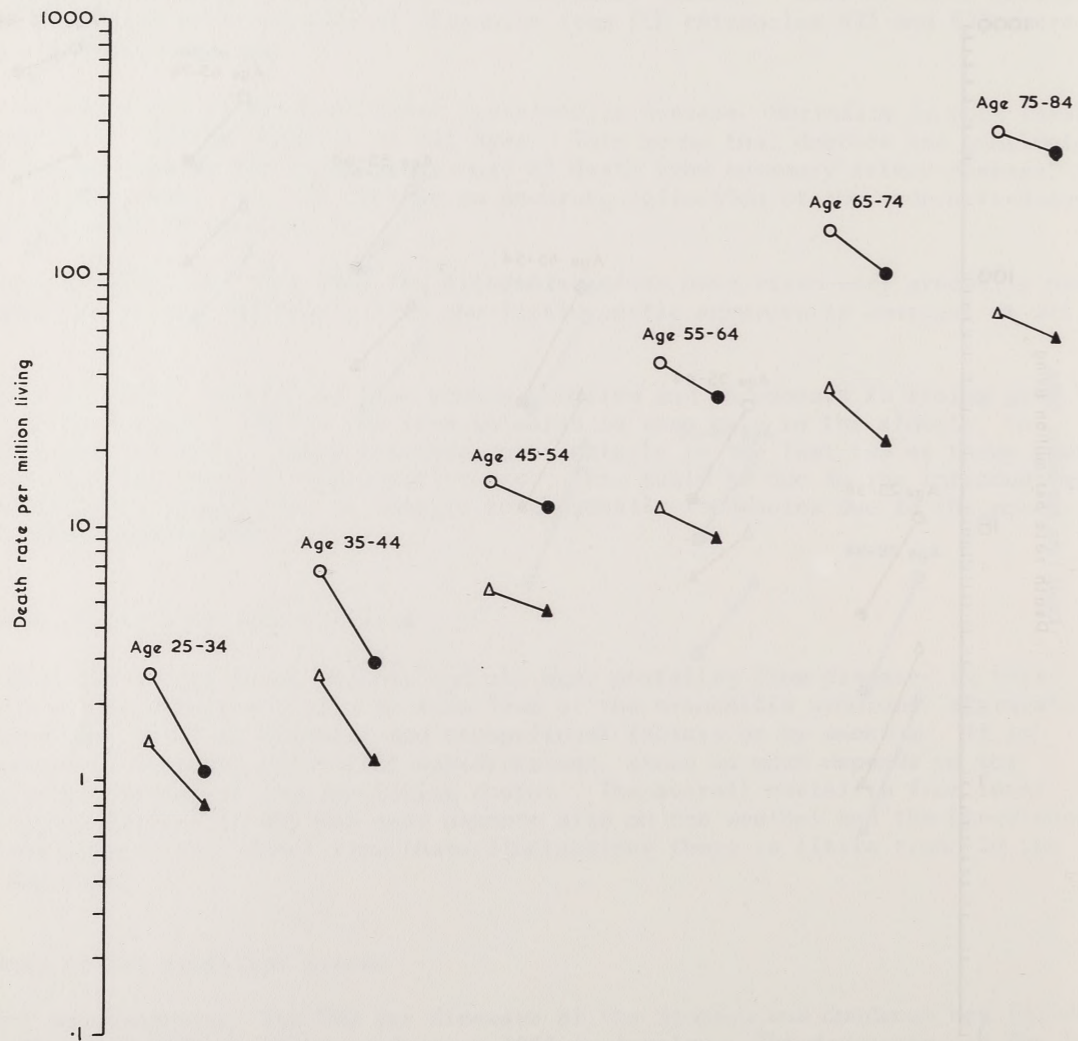


Gastric ulcer: annual average death rate per million living, by age, England and Wales

Diagram 8b

Females 1954-56, 1964-66

1954-56 1964-66
 ○ — ● All gastric ulcer
 ▲ — ▲ Perforated gastric ulcer

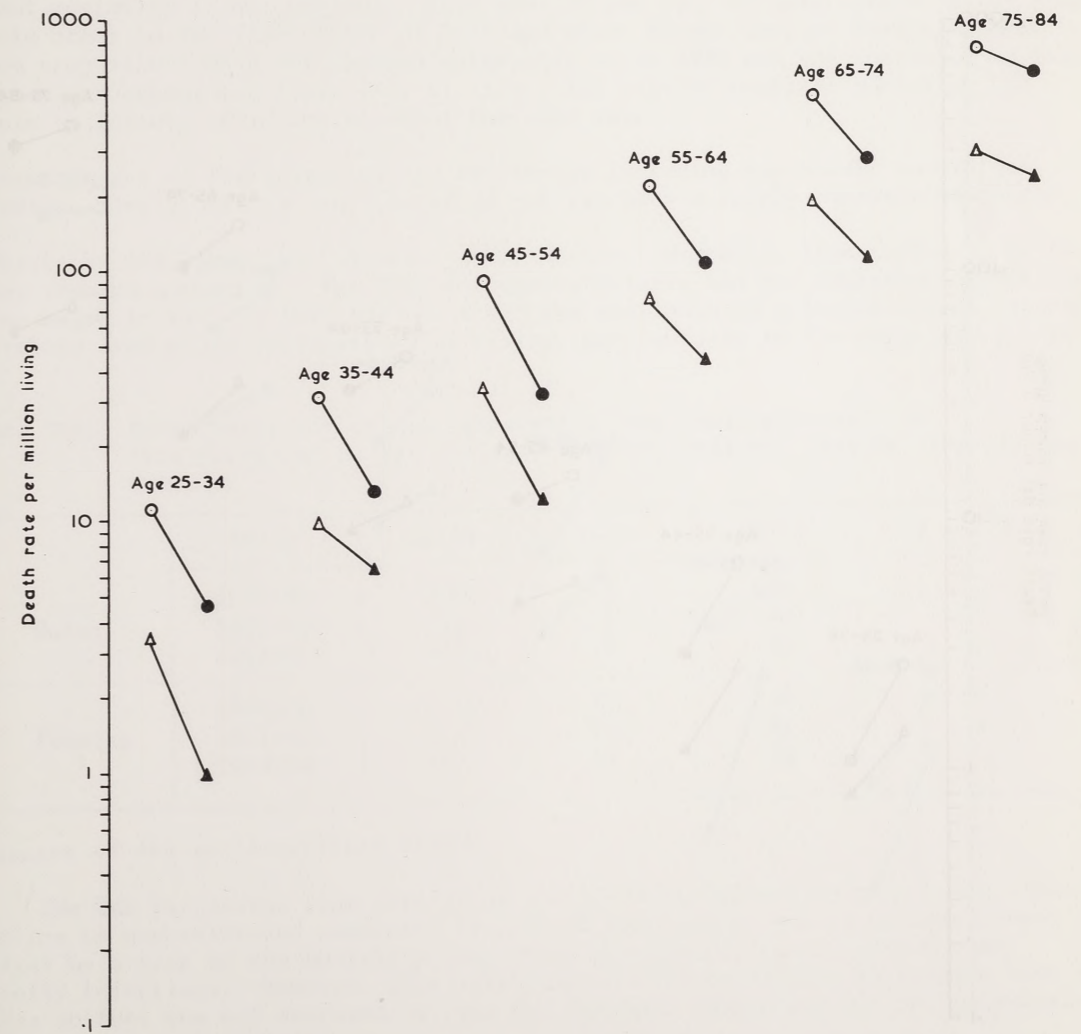


Gastric ulcer : annual average death rate per million living , by age , England and Wales

Diagram 9a

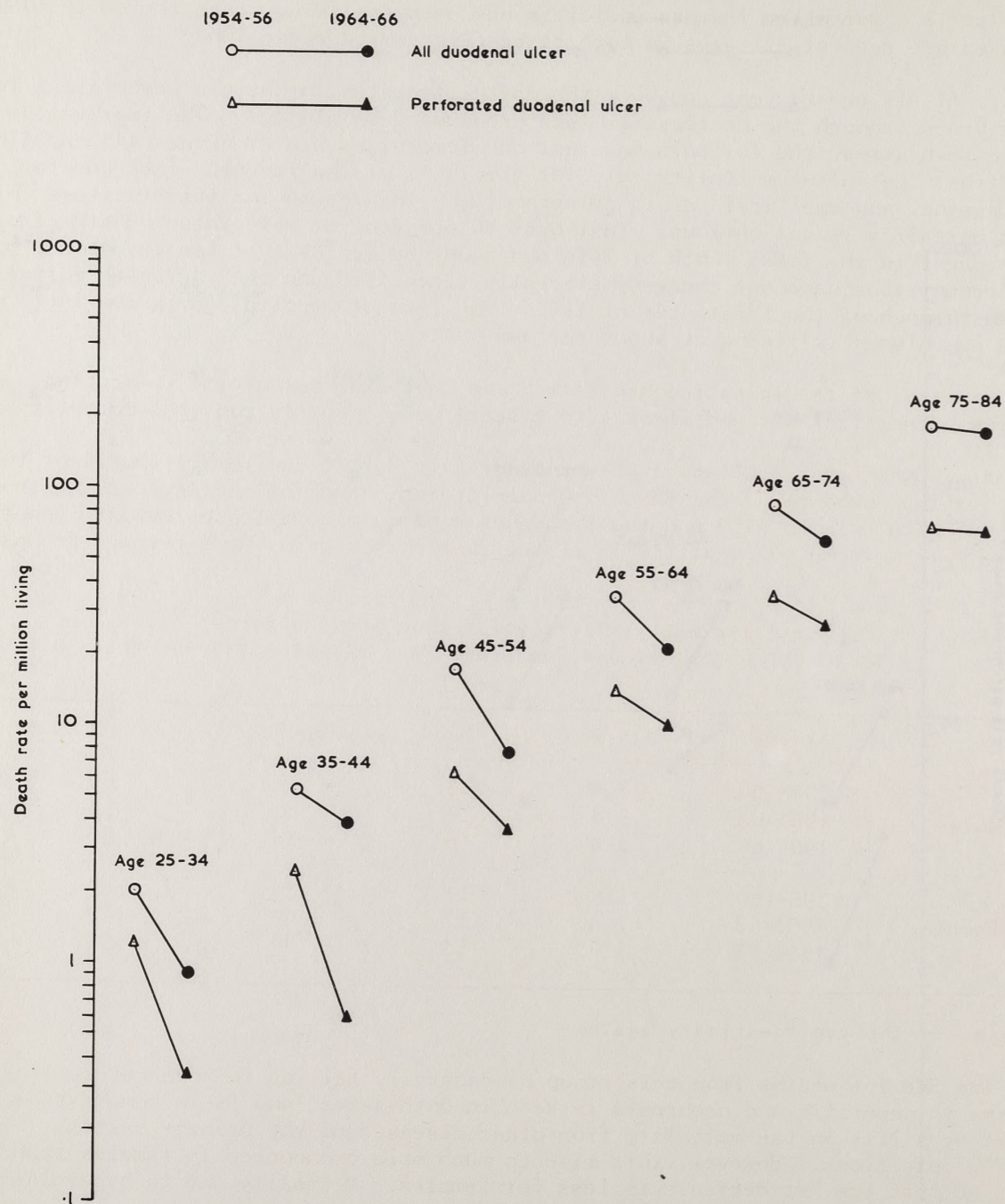
Males 1954-56, 1964-66

1954-56 1964-66
 ○ — ● All duodenal ulcer
 ▲ — ▲ Perforated duodenal ulcer



Duodenal ulcer : annual average death rate per million living , by age , England and Wales

Diagram 9b
Females 1954-56, 1964-66



Duodenal ulcer: annual average death rate per million living, by age, England and Wales

mortality is proportionately the same for deaths with mention of perforation as for those without mention of perforation. This suggests that the decreased mortality is due either to a reduced incidence of peptic ulceration, or a lessening in the overall severity, rather than improved treatment of complications.

Appendicitis. Mortality from appendicitis has been declining since the early 1950's. Decreases are seen at all ages in both sexes (Diagrams 10a and 10b).

Hernia. At all ages 1 year and over the mortality rates for hernia have fallen in recent years, though the decrease is less pronounced in old age. The improvement is seen in both sexes, and for both inguinal and femoral hernia (Diagrams 11a and 11b). In contrast the infant mortality rate for hernia is rising in both sexes and for both inguinal and umbilical hernia (Diagram 12). The reason for this increase in infant mortality is not obvious. Just over 80 per cent of male infant deaths from hernia occur in the first month of life and about 90 per cent of female deaths, but these proportions have not changed materially since 1958 and the increased mortality is seen throughout the first year of life. The rate of hospital admission for hernia in infancy is rising at about the same rate.

Other diseases of the intestine and peritoneum including mesenteric infarction, volvulus, diverticulitis and ulcerative colitis have a fairly constant mortality.

Diseases of the liver, gall-bladder and pancreas. Mortality from cirrhosis of the liver remains unchanged. The SMRs for cholelithiasis and for cholecystitis without stone began to fall in 1960 and the trend has continued to a lesser extent recently. Mortality from acute pancreatitis is rising, particularly in the older age-groups.

Table C23. Death rates per million population from acute pancreatitis (ICD No. 587.0) by sex and age, 1958-60, 1961-63, 1964-66, England and Wales

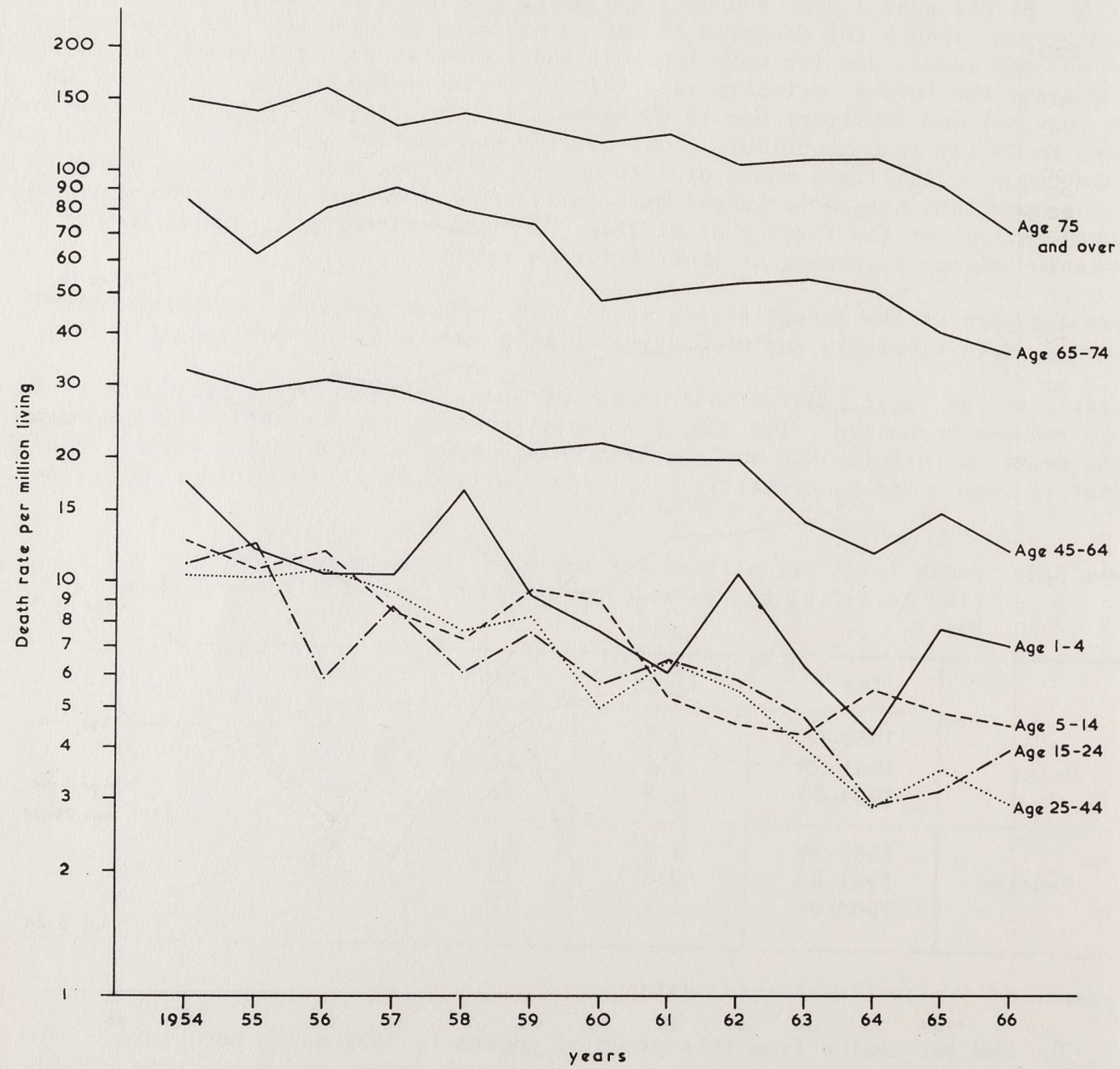
	Years	25-44	45-64	65-74	75 and over
	Males	1958-60	2.4	12	39
	1961-63	3.4	14	40	64
	1964-66	3.3	15	52	85
Females	1958-60	1.8	11	39	59
	1961-63	2.3	12	47	73
	1964-66	1.9	13	44	91

Diseases of the genito-urinary system

The SMR for deaths from this group of causes is falling in both sexes. The decline in nephritis and nephrosis is seen in both sexes, and is to some extent offset by a rise in the mortality from other diseases of the urinary system, chiefly infections. However, this rise is much more pronounced in females than in males so that the net decrease is less for females. Mortality due to hyperplasia of the prostate is falling.

Diagram 10a

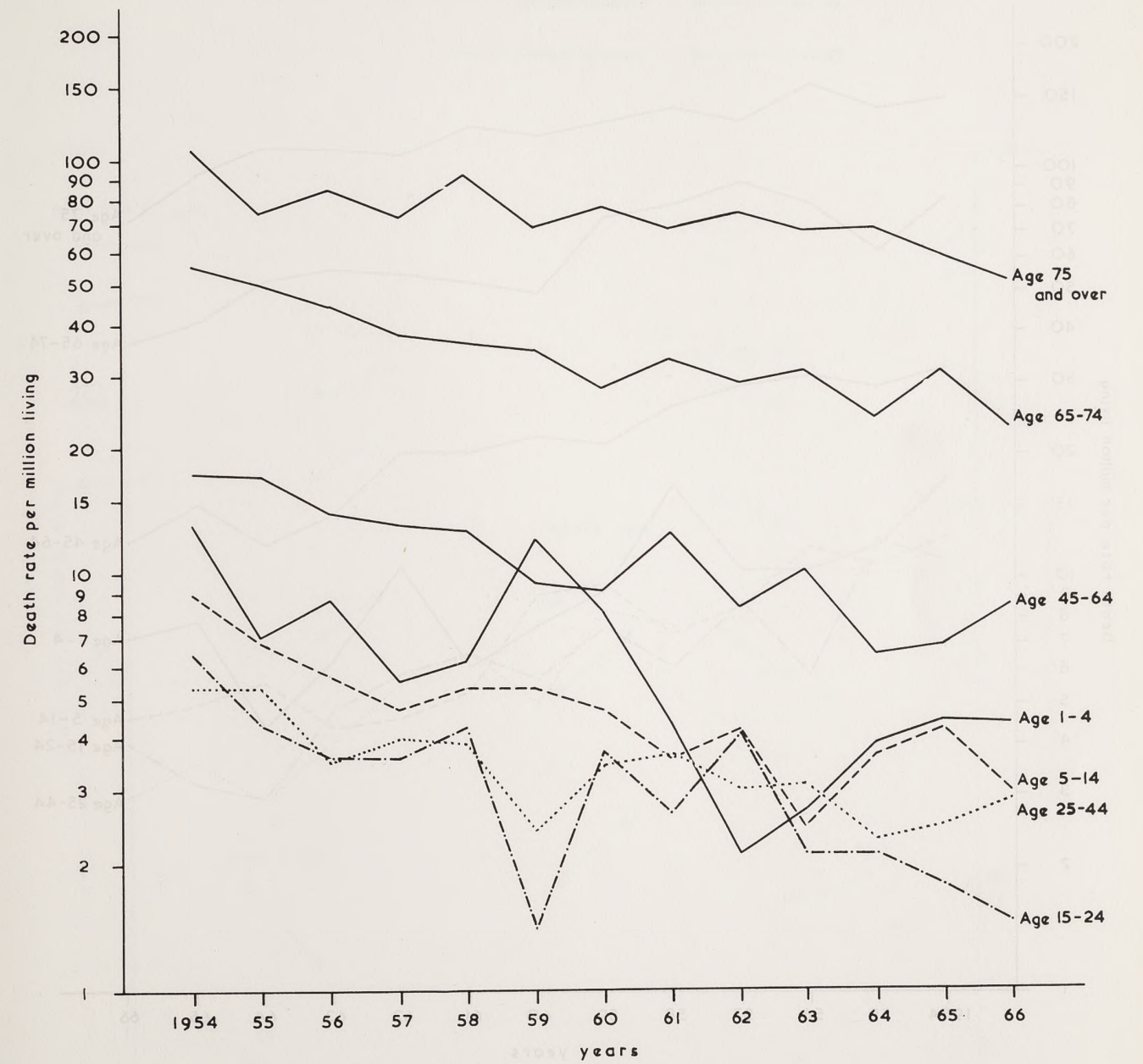
Males



Appendicitis : annual death rates per million living , by age , 1954 to 1966 ,
England and Wales

Diagram 10b

Females



Appendicitis : annual death rates per million living , by age , 1954 to 1966 ,
England and Wales

Diagram IIa

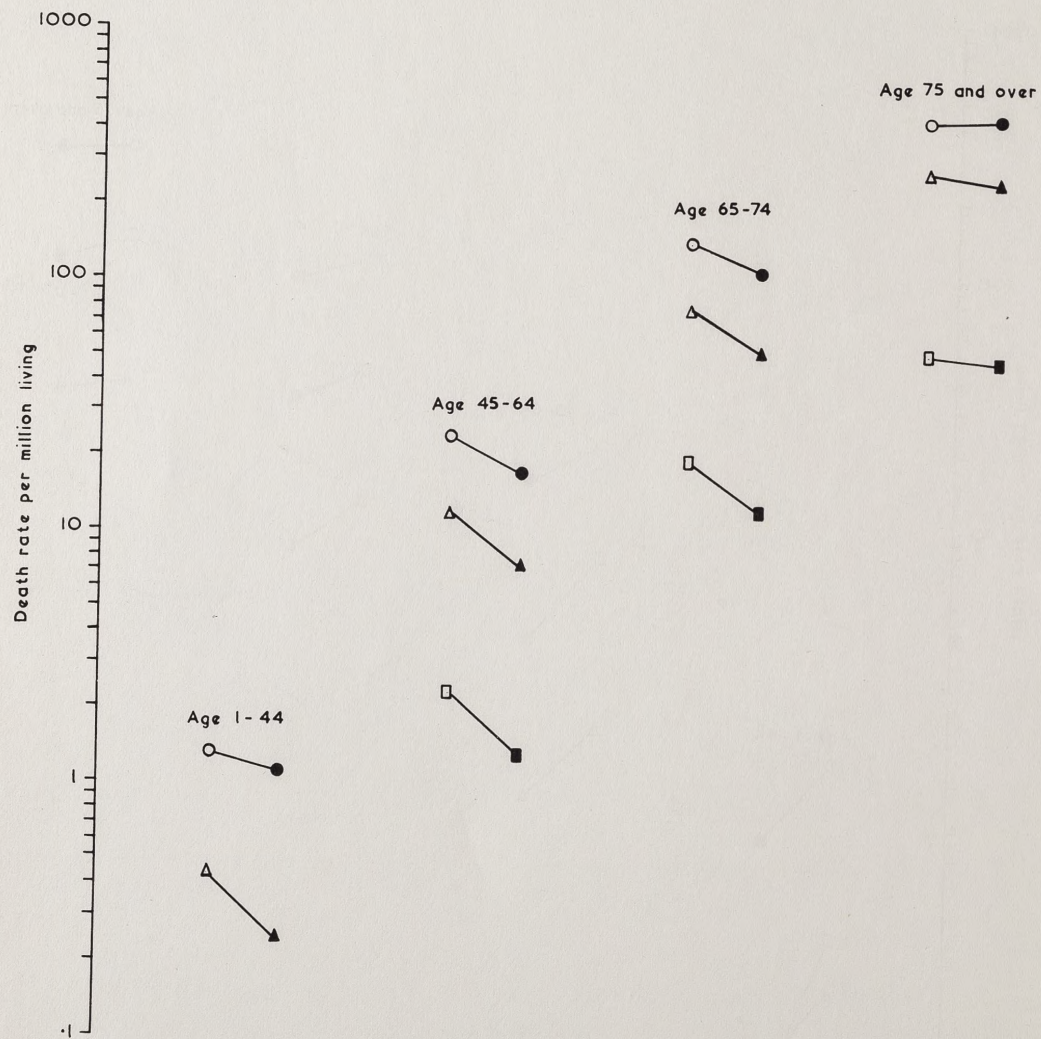
Males 1958-60, 1964-66

1958-60 1964-66

○ — ● All hernia

△ — ▲ Inguinal hernia

□ — ■ Femoral hernia



Hernia : annual average death rate per million living, by age, England and Wales

Diagram IIb

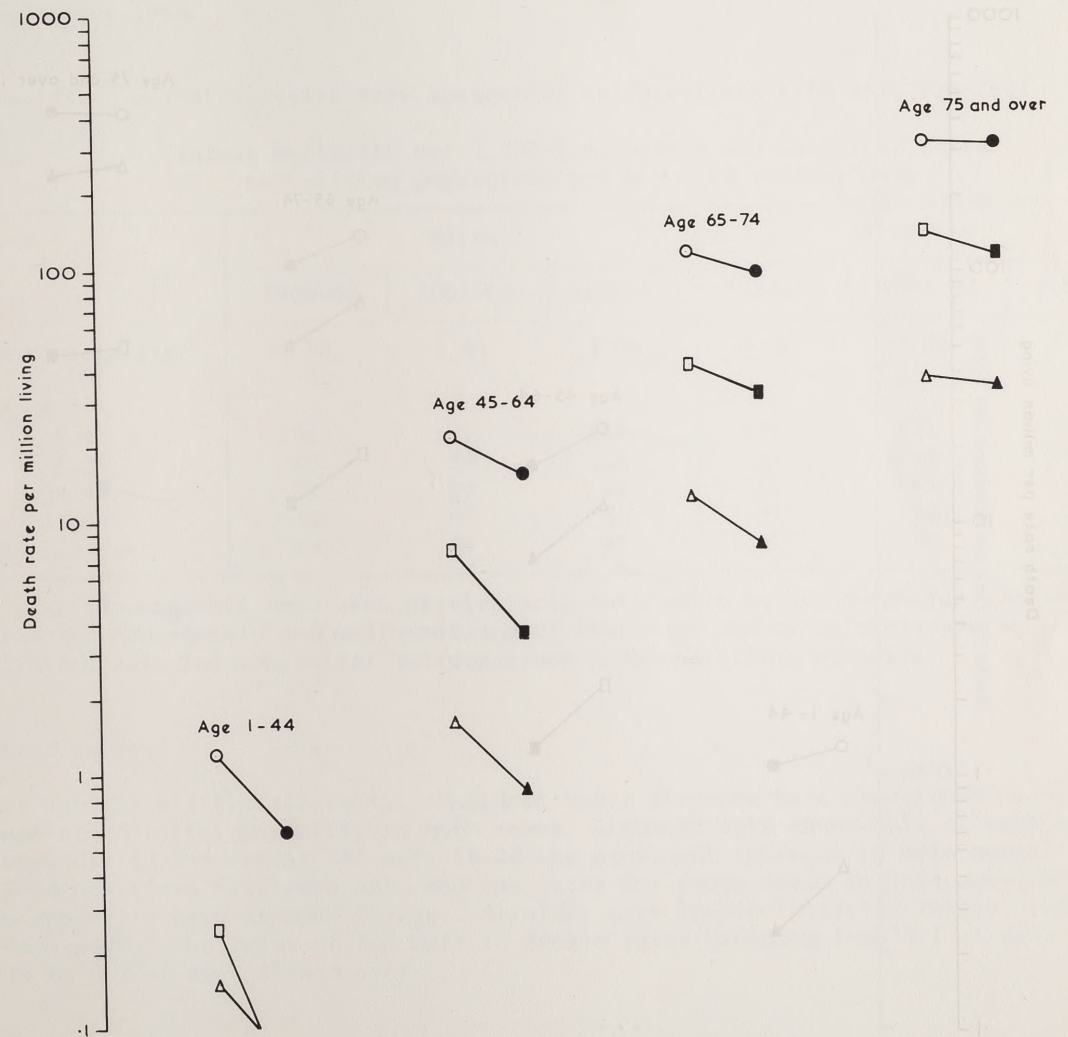
Females 1958-60, 1964-66

1958-60 1964-66

○ — ● All hernia

△ — ▲ Inguinal hernia

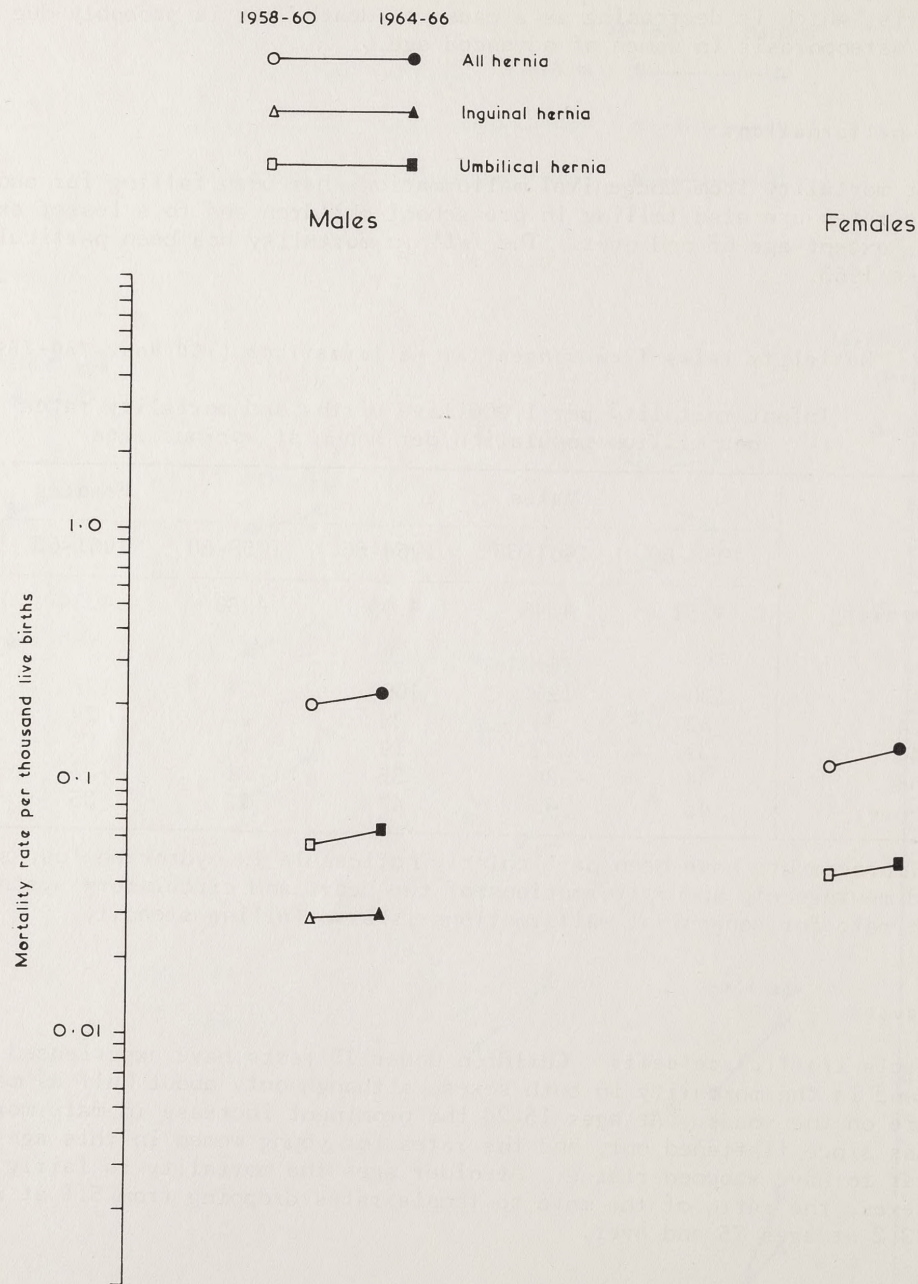
□ — ■ Femoral hernia



Hernia : annual average death rate per million living, by age, England and Wales

Diagram 12

Infant mortality 1958-60, 1964-66



Hernia: annual average infant mortality rate per 1,000 live births, by sex, England and Wales

Diseases of the bones and organs of movement

Mortality attributed to these diseases is on the whole stable. The increasing SMR in females for 'Osteomyelitis and other diseases of bone' is not due to osteomyelitis, which is decreasing as a cause of death, but is probably due to increasing osteoporosis in women of advanced age.

Congenital malformations

Infant mortality from congenital malformations has been falling for about ten years. The rates are also falling in pre-school children and to a lesser extent at older ages, except age 65 and over. The fall in mortality has been particularly marked since 1963.

Table C24. Mortality rates from congenital malformations (ICD Nos. 750-759)

Infant mortality per 1,000 live births and mortality rates per million population per annum at various ages

	Males			Females		
	1958-60	1961-63	1964-66	1958-60	1961-63	1964-66
Infant mortality	4.58	4.46	4.09	4.50	4.34	3.81
Ages:						
1-4	130	121	109	124	121	108
5-24	32	34	28	27	24	25
25-44	22	22	19	18	18	15
45-64	34	36	35	31	33	29
65 and over	45	45	47	27	35	33

The improvements have been particularly noticeable in hydrocephalus, spina bifida and meningocele and malformations of the heart and circulatory system. The stillbirth rate for congenital malformations is also falling steadily.

Violent causes

Motor vehicle traffic accidents. Children under 15 years have experienced a slight upward trend in the mortality in both sexes, although only about half as many girls as boys die on the roads. At ages 15-24 the prominent increase in male mortality up to 1964 has since flattened out, and the rates for young women in this age-group also appear to have stopped rising. At older ages the mortality is fairly constant in both sexes, the ratio of the male to female rates dropping from 5:1 at ages 15-24 to 3:2 at ages 75 and over.

Accidents in the home and residential institutions. At all ages under 65 in males and at ages 1-4 and 45-64 in females there is a gradual upward trend in the rates for home accidents. At age 65 and over the rates have fallen since 1963. This may, however, be due to the less severe winter hazards.

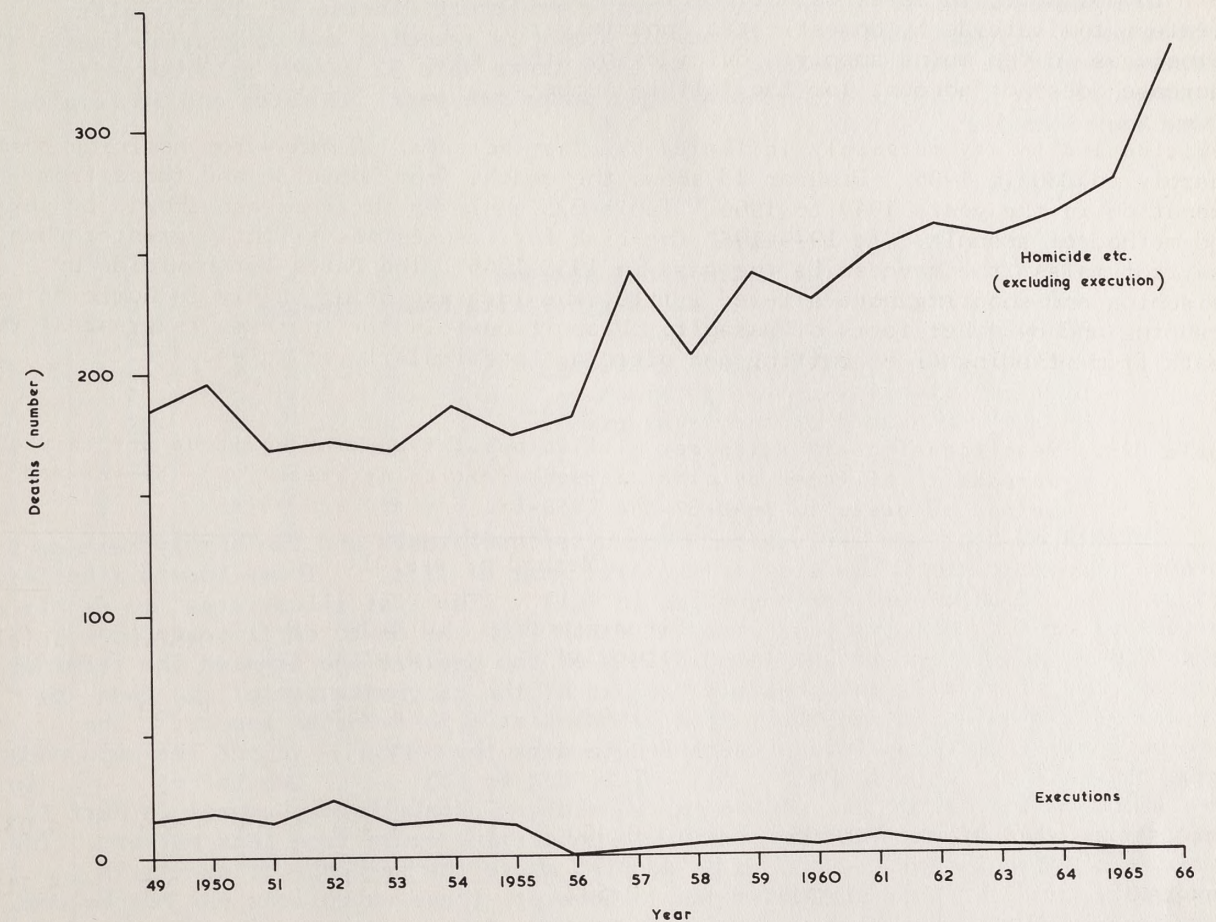
Suicide. The SMR for male suicides has fallen sharply since 1963. That for females rose equally sharply in 1962 and 1963 and has since resumed its previous level. The fall in mortality in males is noticeable at ages 45 and over. The reduction is greatest for suicide by domestic gas, possibly reflecting the introduction of less lethal gas in the mains supply. Suicides by other gases are increasing, but this increase does not account for the fall in numbers using domestic gas.

Homicide and injury purposely inflicted by other persons. Deaths from homicide rose sharply to 330 in 1966. Diagram 13 shows the deaths from homicide and those from execution in the years 1949 to 1966. Table C25 analyses the increase shown, by sex and method of assault. In 1949-1957 the risk for females was slightly greater than that for males, the reverse is the case in 1958-1966. The rates for homicide by poisoning and shooting have altered little, the increase being mainly in homicide by stabbing and by other forms of assault. Proportionately the increase is greatest in death from stabbing (i.e. cutting and piercing) particularly in males.

Table C25. Mean annual death rates per million population from homicide and injury purposely inflicted by other persons (excluding execution), by sex and method of assault, 1949-57 and 1958-66, Eng'and and Wales

	Method of assault				Total
	Poisoning	Firearm and explosive	Cutting and piercing	Other	
	E 980	E 981	E 982	E 983	
Males					
1949-57	0.606	0.460	0.460	2.508	4.033
1958-66	0.571	0.502	1.343	3.297	5.713
Percentage change	-6	+9	+192	+31	+42
Females					
1949-57	0.674	0.412	0.674	2.590	4.351
1958-66	0.592	0.435	0.990	3.251	5.268
Percentage change	-12	+6	+47	+26	+21

Diagram 13



Deaths from homicide and injury purposely inflicted by other persons, and from execution, 1949 to 1966, England and Wales

INFANT MORTALITY

Cardiovascular disease in infancy

The persistence of infant deaths from circulatory disease in the mortality tables makes strange reading. Rheumatic fever is receding and congenital heart disease should be coded elsewhere. In 1966 there were 52 deaths attributed to diseases of the circulatory system at ages under one year, 33 males and 19 females. These were coded as follows:-

ICD No.		
400-402	Rheumatic fever	3
410-416	Chronic rheumatic heart disease	2
420-422	Arteriosclerotic and degenerative heart disease	9
430-434	Other diseases of heart	20
440-447	Hypertensive heart disease	1
450-456	Diseases of the arteries	2
460-468	Diseases of the veins etc.	15
		<u>52</u>

Infants do not, however, suffer from arteriosclerosis and can hardly develop chronic rheumatic heart disease in the first year of life. These inconsistencies prompt the listing of the death entries in full. The list illustrates the difficulties of coding an underlying cause of death from the death certificate (see Table C26). The latter is completed by one of the doctors who treated the terminal illness, or, if this is not possible because of the circumstances of the case, by the coroner, usually on the basis of a pathologist's post-mortem report. The internationally approved form of certificate asks the certifier to put the main underlying cause(s) of death in Part I (a) -----, due to (b) -----, due to (c) -----, in reverse chronological order, and to put subsidiary, contributory causes in Part II. The coding rules of the ICD then derive an underlying cause from this pattern. The rules also prescribe procedures to be adopted where the sequence of events is impossible, and in other circumstances. However, these exceptions can not be comprehensively listed, so that much is left to the *ad hoc* judgment of a coder and it is small wonder that, notwithstanding the excellent work done in evolving the best compromise available in the work of drafting and revising the ICD codes and rules, and allowing full credit to the high efficiency and industry of coders, still some of the coding decisions in the list can be amenable to alternative solutions. For example, the cases of aortic stenosis (Nos. 8, 9 and 10 in Table C26) would better have been coded to congenital heart disease even though the word 'congenital' was not specified, since such is the rule for deaths under 1 year. The same comment could apply to mitral stenosis (No. 4), pulmonary stenosis (No. 11) and endocardial fibrosis (No. 12).

Table C26. Deaths of infants under 1 year of age from diseases of the circulatory system, 1966, England and Wales

Serial number	Sex	Age	Certified by	Diagnosis on certificate		Coded diagnosis	
				Part I	Part II		
				a.	b.		
1	Male	4 months	Coroner	Toxaemia	Acute pericarditis	-	401.0
2	Female	11 "	"	Acute pericarditis	-	-	401.0
3	Male	3 "	"	Capillary bronchitis	Rheumatic endocarditis	-	401.1
4	"	6 "	Doctor	Mitral stenosis	-	-	410
5	"	6 "	Coroner	Rheumatic endocarditis	-	-	414
6	Female	1 month	Doctor	Myocardial infarction	-	-	420.1
7	Male	1 "	"	Cardiac failure	Aortic stenosis (operated)	-	421.1
8	"	2 months	"	Aortic stenosis	-	-	421.1
9	Female	2 "	"	Sub-aortic stenosis	-	Anaemia	421.1
10	Male	4 "	Coroner	Bronchopneumonia	Sub-aortic stenosis	-	421.1
11	"	2 "	Doctor	Cardiac arrest	Pulmonary valvular stenosis	-	421.4
12	Female	4 "	Coroner	Myocardial failure	Endocardial fibrosis accelerated by respiratory infection	-	421.4
13	Male	1 month	Doctor	Inhalation of vomit (sudden death) [corrected later to myocarditis (viral)]	-	Phenylketonuria	422.2
14	"	1 "	"	Acute cardiac failure	Myocarditis	Congestive heart disease	422.2
15	"	1 "	Coroner	Bronchopneumonia	Acute endocarditis (aortic and mitral valves)	-	430.0
16	Female	10 months	"	Bronchopneumonia	Sub-acute bacterial endocarditis secondary to meningococcal meningitis	-	430.0
17	Male	1 month	Doctor	Congestive cardiac failure	Viral myocarditis	-	431
18	"	2 months	Coroner	Toxic myocarditis and pulmonary oedema	Viraemia	-	431
19	Female	2 "	Doctor	Congestive cardiac failure	Virus myocarditis	-	431
20	Male	2 "	Coroner	Acute myocarditis	-	-	431
21	"	3 "	Doctor	Cardiac failure	Acute viral myocarditis	Acute bronchitis	431
22	Female	3 "	Coroner	Acute myocarditis	-	-	431
23	"	4 "	Doctor	Viral myocarditis	-	-	431
24	Male	11 "	"	Syncopal attack with cardiac arrest	-	-	433.0
25	Female	1 month	"	Congestive disease of the heart	-	-	434.1
26	Male	1 "	"	Extensive pneumonia	Mild congestive heart failure	-	434.1

Table C26 - (continued)

Serial number	Sex	Age	Certified by	Diagnosis on certificate		Coded diagnosis	
				Part I	Part II		
				a.	b.		
27	Male	1 month	Doctor	Bronchiolitis	Congestive heart failure and circulatory failure	-	434.1
28	Female	2 months	"	Congestive heart disease and convulsions	-	-	434.1
29	Male	2 "	"	Congestive cardiac failure	-	Spastic paraplegia	434.1
30	"	4 "	"	Pyrexia of unknown origin	-	Congestive cardiac failure. Anaemia	434.1
31	Female	4 "	"	Bronchopneumonia	Congestive cardiac failure	-	434.1
32	"	1 month	"	Idiopathic cardiomegaly	-	-	434.4
33	Male	3 months	"	Idiopathic cardiac hypertrophy	-	-	434.4
34	Female	6 "	"	Myocardial hypertrophy	-	-	434.4
35	"	8 "	Coroner	Congestive heart failure	Hypertension	-	443
36	Male	4 "	Doctor	Coronary thrombosis	Coronary sinus thrombosis	-	456
37	Female	6 "	"	Cardiac failure	Polyarteritis nodosa Myocarditis	-	456
38	Male	1 week	Coroner	Uraemia	Peri-arteritis nodosa Bilateral infarction of kidneys. Renal vein thrombosis	-	466
39	"	1 "	Doctor	Renal vein thrombosis	-	-	466
40	"	1 "	"	Uraemia	Renal vein thrombosis	-	466
41	"	2 weeks	"	Venous infarction of kidney	-	-	466
42	"	2 "	"	Renal failure	Renal vein thrombosis	-	466
43	"	2 months	"	Anuria (renal vein thrombosis)	-	-	466
44	Female	7 "	Coroner	Renal infarction	Renal vein thrombosis	-	466
45	Male	6 hours	"	Pulmonary embolism	-	-	465
46	"	4 months	"	Toxaemia due to acute haemorrhage	Bronchopneumonia	-	467.2
47	Female	3 "	"	Bronchiolitis	Acute mesenteric lymphadenitis	-	468.1
48	"	4 "	"	Bronchiolitis	Mesenteric lymphadenitis	-	468.1
49	"	4 "	"	Aspiration of vomit	Streptococcal septicaemia Mesenteric adenitis	-	468.1
50	Male	9 "	"	Bronchiolitis	Acute mesenteric lymphadenitis	-	468.1
51	"	3 "	"	Acute generalised peritonitis	Non-specific adenitis	-	468.2
52	"	2 weeks	Doctor	Chylothorax	-	-	468.3

The shuffling of diagnoses into the necessarily broad groupings of a statistical classification tends to obscure certain syndromes which might be of interest. Thus there were two cases of peri/poly-arteritis nodosa with heart involvement (Nos. 36, 37) and seven cases of renal vein thrombosis (Nos. 38-44).

A feature of this list is that so many of the diagnoses are clearly synonymous with 'don't know'. In this age-group, where it is acknowledged that many infants die suddenly from causes that are not fully understood, the discretion of certifying clinicians and pathologists is unavoidably circumscribed. To avoid the possibility of implying that death was not due to natural causes (there being no suggestion that this was the case), the doctor may feel impelled to seek some abnormality, however trivial, to which the death can be attributed, or to concoct a diagnosis on supposition.

There is no easy solution to this problem. It has been suggested that a single fictitious diagnosis be used uniformly, but it is difficult to see how such a 'conspiracy' could be organised and a proposal to absolve the doctor from writing anything but 'Natural causes' on any legal death certificate and later completing a confidential diagnostic questionnaire (perhaps with additional post-mortem or other information) would offend against accepted principles of certification. It is to be hoped that a solution will eventually be found based on an improved knowledge of the causes of infant deaths.

Violent death in infancy

The new-born infant is completely defenceless and his tenuous grasp on life depends on the instinct to protect which he arouses in his parents and others. The risk of accidental or violent death is great throughout the first year of life. In the early months the muscles are too weak to move him from a suffocating pillow, or so it is said, and later he totters into dangers without the strength to retract.

In the period 1848-72 one per cent of infant deaths were attributed to accident, poisoning and violence (reference: *Registrar General's Decennial Supplement*, 35th Report, 1861-1870, Tables 33 and 34). The infant mortality rate at that time was about 150 per thousand live births so that the contribution of violent death to infant mortality was 1.5 per thousand. In 1964-66 four per cent of infant deaths were attributed to accidents, poisoning or violence, contributing 0.8 per thousand to a total infant mortality of 19 per thousand live births. Thus although the over-all risk of dying in the first year of life has been reduced to one eighth of that existing 100 years ago, the risk of violent death is still over half what it was in the days of Nightingale and Farr.

Some infants establish no protective bond with any adult, for their births are inconvenient to the social group and they perish from inattention and violence at birth. Fifty-four infants (30 male and 24 female) died in this way in 1966. Five were legitimate births, three dying of 'inattention', one from cold injury after being born into a lavatory pan, and one the victim of infanticide in a manner not ascertained. Twenty-eight of these deaths were illegitimate, twenty being ascribed by the coroner to inattention, asphyxia from birth fluid or bleeding from umbilicus; four died of fractured skull, two were strangled, one stabbed and one drowned in a bucket. Twenty-one bodies of new-born infants were found for whom no

mother could be traced, five in river or canal, five in women's lavatories and eleven elsewhere. The deaths of six of these twenty-one nameless infants were closely associated with physical violence in the form of head injury or strangulation, three being attributed to murder and three cases resulting in open verdicts. The other fifteen had been left to their fate.

Even if the infant is not rejected at birth his dependency can provoke assault instead of care. Of infant deaths after one day of survival in 1966 forty-two were cases of infanticide, manslaughter, or violent death in such circumstances that the coroner returned an open verdict. The forty-two cases comprised twenty-three males and nineteen females, nine illegitimate, four the children of servicemen, ten from Social Class V, seven from Social Class IV, eight from Social Class III, three from Social Class II and one from Social Class I. The age at death of these infants is unevenly distributed throughout the first year, twenty having occurred within the first four months. Twenty-three died from fractured skull and similar gross violence, often multiple injuries - the 'battered baby' of contemporary nomenclature, eight died from asphyxia due to strangulation or smothering, three were gassed, two poisoned, one burned to death and one drowned. Four died of malnutrition resulting from gross neglect.

This dreadful list is almost certainly not complete, and the concept of neglect is not sharply defined, ranging from deliberate malpractice to carelessness. Forty-five infants (26 males and 19 females) died from head injuries or other severe injury, chiefly due to falling and striking the head, although three were attacked by other children and two by dogs. Similarly ten infants, seven of them males, died from strangulation by parts of clothing etc. or by the bars of the cot. All but one of these were over six months old.

In 1848-72 about two thirds of the infant deaths from accident, poisoning and violence were attributed to accidental mechanical suffocation, and this is still true a hundred years later. In recent years the accuracy of many of these diagnoses has been questioned, and a syndrome of 'sudden unexplained death in infancy' has been delineated, incorporating this type of case and some where the death is attributed to virus infection, myocarditis, status lymphaticus and other vague diagnoses.

Looking at the death certificates of infants dying from accidental mechanical suffocation one finds some groups in which the diagnosis seems fairly certain - inhaled foreign body other than vomit, and suffocation due to overturning of the cot or pram. Twelve babies died by choking on a foreign body, in five cases a teat or comforter was to blame. Four infants were smothered when the cot overturned and one when her pram tipped over. Of the other 132 deaths attributed to smothering, eighteen occurred in the parents' bed or were described as 'overlying'. Two hundred and eighty-four deaths were said to be due to inhaled vomit. These are the diagnoses the validity of which is doubted by some, for they claim that even a new-born infant is able to free its head from a suffocating pillow and awaken all but a drunken sleeping parent, whilst the regurgitation of milk and its presence in the air passage can occur *in extremis* or after death from any cause. All are said to be part of a syndrome, the aetiology of which is obscure, possibly a virus infection possibly allergic in nature.

It is therefore interesting to compare these groups of infant deaths with regard to the other information from the death certificate - sex, age at death,

season of death, place of death, legitimacy and occupation of father. The numbers in the 'overlying' group are small, so that the greater excess of males and the earlier age at death may be chance effects. Differences between the 'inhaled vomit' and 'smothering' groups are minimal, consistent with the assumption that the two categories are the same syndrome. There are some area differences, but these may be due to a tendency for certain pathologists to favour one diagnosis more than another. Comparing the group as a whole with all infant deaths it is seen that the sex ratio is very nearly the same as is the proportion of illegitimate babies, but there are differences in all other respects. The asphyxia group tend to die a little later than average, the seasonal variation is more pronounced and the weighting of Social Classes IV and V is heavier. The incidence seems higher in the North and West, but this may be associated with social class differences (see Table C27).

Five infant deaths were attributed to anaphylaxis; two followed medical treatment but the other three could well have been deaths of sudden unexplained aetiology.

Twenty-five infants died from burns and one from scalds. Of those burned to death twenty-one died when their habitation caught fire. In five cases an oil stove was specifically indicted. Twenty of the deaths from burning occurred in the first and last quarters of the year.

Twenty infants were killed in traffic accidents, 11 males and 9 females; 15 were passengers in vehicles involved in collisions, 3 were killed when vehicles collided with a pram and 2 were killed in car accidents without precise details.

Accidental poisoning accounted for four infant deaths, one from coal gas and three from drugs. Three infants were drowned accidentally, two after falling into a river and one in the bath when the mother fainted. Three infants were electrocuted accidentally and one died of heat exhaustion.

Table C27. Violent deaths in infancy, 1966, England and Wales

	Inhaled Vomit		Smothering (own bed)		Overlaying		Total		All infant deaths			
	Number	per cent	Number	per cent	Number	per cent	Number	per cent	Number	per cent		
Total	284	100	114	100	18	100	416	100	16,147	100		
Sex												
Males	161	57	71	62	15	83	247	59	9,357	58		
Females	123	43	43	38	3	17	169	41	6,790	42		
Age at death												
0- 2 months	130	46	54	47	11	61	195	47	13,031	81		
3- 5 months	106	37	45	39	6	33	157	38	1,737	11		
6- 8 months	36	13	7	6	-	-	43	10	866	5		
9-11 months	12	4	8	7	1	6	21	5	513	3		
Season of death												
1st quarter	90	32	28	25	8	44	126	30	4,354	27		
2nd quarter	65	23	30	26	3	17	98	24	3,824	24		
3rd quarter	56	20	25	22	1	6	82	20	3,740	23		
4th quarter	73	26	31	27	6	33	110	26	4,229	26		
Region of death												
North	39	14	11	10	2	11	52	12	1,198	7		
Yorkshire and Humberside	24	8	4	4	2	11	30	7	1,881	12		
North West	51	18	26	23	6	33	83	20	2,603	16		
East Midlands	21	7	-	-	1	6	22	5	1,144	7		
West Midlands	34	12	16	14	1	6	51	12	1,836	11		
East Anglia	11	4	1	1	-	-	12	3	460	3		
South East	55	19	42	37	4	22	101	24	5,087	32		
South West	25	9	12	11	2	11	39	9	1,027	6		
Wales	24	8	2	2	-	-	26	6	911	6		
Occupation of Father (by social class)	Number	per cent	per cent of I-V	Number	per cent	per cent of I-V	Number	per cent	per cent of I-V	Number	per cent	*per cent of I-V
I Professional	2	1	7	4	4	12	-	-	-	6	1	8
II Intermediate	15	5		7	6		-	-	-	22	5	
III Skilled	110	39	47	42	37	45	9	50	60	161	39	47
IV Partly skilled	57	20		21	18		4	22		82	20	
V Unskilled	49	17	45	20	18	44	2	11	40	71	17	45
Armed Forces	11	4		6	5		-	-		17	4	
Illegitimate	29	10		11	10		2	11		42	10	
Not classified	11	4		3	3		1	6		15	4	
										1,646	10	

* Based on 10 per cent sample of births registered in England and Wales from 1st July 1963 to 30th June 1964.

M I S C E L L A N E O U S

Accuracy of stated age at death

Since the earliest days of vital registration the accuracy of stated age has been the subject of concern and scrutiny by statisticians. The conscious under or overstatement of age in life by reason of vanity or for the purpose of fraud may rarely lead to repetition of an error on the death certificate. A more common source of error arises from genuine ignorance resulting in random errors or a tendency to round to a favourite number. It is possible to test for digital preferences by examination of large numbers of register entries. This has often been done in the past. It is of more direct interest to check the accuracy of the stated age by reference to an independent source.

The National Health Service Central Register (NHSCR) derived from the procedure of National Registration occasioned in 1939 by the stress of war. Each person in England and Wales was given an identity number and this numbering was extended to subsequent births through the process of birth registration. After the war the file was retained in connection with the continuing rationing of food, and later became the basis of a central register to facilitate movement of information and records between Executive Councils in the National Health Service. Changes of area are entered in the record when people register with a different doctor under the NHS, and deaths are noted routinely from information provided in death registration.

For persons registered initially in 1939, a presumption of accuracy of the date of birth noted in the register is based on the fact that the information has been repeated and checked from time to time. For subsequent births the presumption approaches certainty since the information is related directly to birth registration.

A sample of all the death entry copies being processed in the NHSCR was taken in April 1966. Sampling was achieved by selecting all those with surnames beginning with A or B, and this method provided approximately 12 per cent of the total of 5,300 forms. The sample was not fully representative because certain categories of deceased persons were not available and in consequence the age distribution of the sample is distorted in comparison with that of all deaths in England and Wales in April 1966 and this is illustrated in Table C28. There is only a single infant death in the sample, the first three decades are over-represented and the older ages under-represented.

Table C28. Distribution of deaths. Total and number in sample. England and Wales

Age	England and Wales		Sample	
	Number	Per cent	Number	Per cent
0-	1,339	2.77	1	0.16
1-	234	0.48	33	5.13
5-	123	0.25	34	5.29
10-	286	0.59	42	6.53
20-	395	0.82	28	4.35
30-	631	1.31	3	0.47
40-	1,798	3.72	11	1.71
50-	4,979	10.31	44	6.84
60-	10,277	21.27	117	18.20
70-	14,285	29.57	168	26.13
80-	6,976	14.44	78	12.13
85-	6,989	14.47	84	13.06
Total	48,312		643	

Table C29 compares the stated age last birthday with the 'true' age taken from the NHSCR records. Of the 643 entries in the sample, 94 (14.6 per cent) showed inaccuracy as to the year. (The lack of data on infant deaths makes an estimate of accuracy as to month of age unprofitable). It is clear from Table C29 that the proportion of inaccuracies increases with age, and if the fractions in each age-group are weighted with the numbers of deaths in each age-group in England and Wales in 1966 the overall percentage inaccuracy is increased to 16.1.

Table C29. Accuracy of statement of age last birthday (in years) on a sample of 643 death certificates

True Age	No. correct	No. incorrect	Total	Per cent incorrect
0-9	66	2	68	3
10-19	42	0	42	-
20-29	23	5	28	18
30-39	3	0	3	-
40-49	11	0	11	-
50-59	39	5	44	11
60-69	103	14	117	12
70-79	140	28	168	17
80-89	104	35	139	25
90 & over	18	5	23	22
Total	549	94	643	14.6

This rather alarming proportion of inaccurate statements loses some of its importance from a statistical point of view when the types of error are examined. The majority (69 per cent) of the errors are of one year, and only 8.5 per cent are of five years or more (Table C30). The tendency is to overstate rather than understate, particularly for errors of one year. Table C31 shows the distribution according to the last digit of age, both stated and true. In the past it has been suggested that there is a preference for even digits over odd digits and a tendency to round to a multiple of five or ten. Although the numbers of cases here are small, there is some evidence of a tendency to round to terminal zero, particularly from a true age ending in nine. There is no evidence of any rounding to five, in fact there is some indication of a dislike of five as well as nine. Table C32, which gives an analysis of the errors in terms of the customary quinquennial grouping of ages is fairly consoling to the statistician. In only one case was the error further than an adjacent group, there is no error under age 50, and many of the errors cancel so that the corrections required are small. Age-groups 65-69 and 70-74 are under-represented and 75-79, 80-84 over-represented in stated age tabulations. There is some justification for the custom of grouping into 15-24, 25-34, etc. rather than 20-29, 30-39, etc. since the former method would involve slightly fewer errors than the latter, 16 as against 18, but the margin is small on this showing.

Table C30. Frequency of various inaccuracies of statement of age last birthday

Years in error	Number understated	Number overstated
1	23	42
2	3	6
3	3	5
4	0	4
5	0	2
6	1	0
7	0	0
8	0	0
9	0	2
10	2	0
11	0	1
Total	32	62

Table C31. Frequency of terminal digit in stated and true age at death

True age ends in	Stated age ends in										Total	Per cent inaccurate	
	1	2	3	4	5	6	7	8	9	0			
1	72	7						1			2	82	12
2	2	53	6	1	1	1						64	17
3		3	51*	3		1					1	59	14
4			1	52	3	1	1					58	10
5			1	3	66	6	1		2	1		80	18
6					3	61*	3					67	9
7	1				1	3	58	2	2	1		68	15
8		1				1	3	51	3	1		60	15
9				1				2	45	7		55	18
0	3		1				1		3	42		50	16
Total	78	64	60	60	74	74	67	56	55	55		643	
Per cent inaccurate	8	17	15	13	11	18	13	9	18	24			

* including one error of -10

Table C32. Inaccuracy of stated age at death in terms of quinquennial grouping

Actual age	Stated age																	Total	Correction factor					
	0-	5-	10-	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-			85-				
0-	34																		34	1.00				
5-		34																	34	1.00				
10-			17																17	1.00				
15-				25															25	1.00				
20-					22														22	1.00				
25-						6													6	1.00				
30-																			-	1.00				
35-								3											3	1.00				
40-									3										3	1.00				
45-										8									8	1.00				
50-											17								17	1.00				
55-												1	25	1					27	1.00				
60-													1	39					40	1.00				
65-														71	4	1			77	1.00				
70-														1	75	6	1		83	1.00				
75-															79	5	1		85	1.00				
80-															2	74	2		78	1.00				
85-																3	81		84	1.00				
Total	34	34	17	25	22	6		3	3	8	17	25	40	77	83	85	78	84	643					
Correction factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.07	1.05	.97	.94	1.00

Death from ischaemic heart disease on different days of the week

The seasonal variation in mortality from ischaemic heart disease is well known. Deaths attributed to arteriosclerotic heart disease, including coronary disease (ICD No.420), to chronic endocarditis not specified as rheumatic (ICD No.421) and to other myocardial degeneration (ICD No.422) are more frequent in the winter months. This feature is seen in many causes of death and is presumably related to cold, damp weather and the resulting high incidence of respiratory infections. Although the actual day of death is, of course, stated on the death certificate this information is not retained in the process of statistical analysis except for deaths in Greater London. Table C33 shows the deaths (occurrences) in Greater London, attributed to ICD Nos. 420-422 in the 52 weeks beginning 1st April 1965, by day of the week, separately for males and females. The pattern is the same for both sexes. There are two cycles within the week, a deficiency of about 6 per cent of the average on Sunday and a lesser deficiency of about 2 per cent of average on Wednesday. The total chi-square for departures from uniform distribution throughout the week, with six degrees of freedom, is significant at the 5 per cent level for males, not significant for females.

Interpretation of this finding is not easy. Deaths attributed to arteriosclerotic and degenerative heart disease comprise about a quarter of all deaths so that the fluctuation is seen in the figures for all mortality. Further details (not at present available) are needed to show if the daily variation is more prominent at certain ages or within particular diagnostic groups. Even if the effect is shown to be associated with true myocardial infarction varied explanations could be found. The simplest might be that the physical exertion of return to work on Monday precipitated a fatal attack, but other interpretations could be offered in terms of dietary excess at the weekend producing changes in the blood clotting mechanism.

Table C33. Deaths from arteriosclerotic and degenerative heart disease (ICD Nos. 420-422) at all ages, by sex and day of the week, April 1965 to March 1966, Greater London

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Total
Males								
Observed deaths	1,882	1,812	1,752	1,831	1,811	1,748	1,679	12,515
Observed minus expected*	+94	+24	-36	+43	+23	-40	-109	
Contribution to chi-square	4.94	0.32	0.72	1.03	0.30	0.89	6.64	13.94
Females								
Observed deaths	1,493	1,470	1,434	1,500	1,520	1,433	1,378	10,228
Observed minus expected*	+32	+9	-27	+39	+59	-28	-83	
Contribution to chi-square	0.70	0.06	0.50	1.04	2.38	0.54	4.72	9.94

* Expected values calculated on the assumption of an equal risk on each day of the week.

Mass Miniature Radiography

Mass miniature radiography is undertaken either at Chest Clinics or at other centres with the aid of mobile vans, and provides a valuable source of information about the prevalence of tuberculosis and other disease in the population. A ten per cent sample of records from the whole country is analysed each year by the General Register Office. Reconstituted totals for England and Wales in recent years are:

	Males	Females
1960	1,857,700	1,274,110
1961	1,836,580	1,342,700
1962	1,893,410	1,351,550
1963	1,932,590	1,357,930
1964	1,932,860	1,353,520
1965	1,898,580	1,365,090
1966	1,887,770	1,373,120

Details of the examinations, by age-group and category of person examined, are shown in Table C37. The corresponding figures for major subdivisions in past years are set out in Table C35.

There have been increases in the number of patients referred by general practitioners, by hospitals and by psychiatric hospitals, as well as in those known to be exposed to special risks, i.e. 'contacts' and 'inmates of prisons and similar institutions'. Special surveys have become less prominent and, with the cessation of National Service, the use of this facility by the armed forces has declined. References from ante-natal (A.N.) clinics were 2.7 per cent of total births in 1960 and 1.8 per cent in 1966.

The yield of persons requiring treatment or supervision for respiratory tuberculosis (defined as 'close clinical supervision') has decreased by about one third over the past six years. These numbers, expressed as a proportion per thousand of those examined, are shown in Table C36. The greatest decline has been for G.P. referrals, a group which has increased numerically most markedly; the same phenomenon is found for prison cases. It is at first sight surprising that the rates from A.N. clinics were so high (double the average for all groups) but this may be due to potentiation of latent disease. The rates for contacts of tuberculosis patients were low compared with the average.

The number of cases of respiratory tuberculosis uncovered, with the percentage found (a) by survey in factories and offices, (b) for volunteers, and (c) G.P.s., were

Year	Total	(a) Factories and offices	(b) Volunteers	(c) General Practitioners
		per cent	per cent	per cent
1960	4,938	34.5	21.2	31.6
1961	4,473	34.5	22.0	34.2
1962	4,180	34.4	22.3	34.1
1963	4,185	34.1	21.2	32.8
1964	3,998	34.0	19.4	35.8
1965	3,515	32.9	21.6	34.5
1966	3,228	32.0	19.7	36.6

General practitioner referrals have thus been gradually increasing their proportion of total cases found, and since 1964 are the largest single source of discovery.

Concurrently with the declining yield of pulmonary tuberculosis from the M.M.R. examination there has been an impressive increase in the number of other diseases recorded, with the exception of pneumoconiosis. The most marked increase is that shown for malignant neoplasms, the number found by these examinations having increased by almost 50 per cent in the course of six years.

Table C34. Mass miniature radiography. Number of non-tuberculous conditions diagnosed following examination, 1960 to 1966, England and Wales

	1960	1961	1962	1963	1964	1965	1966
Neoplasms							
Malignant	2,534	2,677	2,848	3,081	3,289	3,556	3,684
Non-malignant	585	611	567	610	544	623	633
Lymphadenopathy							
Sarcoids and enlarged hilar glands	615	704	724	758	794	787	878
Other	72	70	65	69	70	81	96
Cardiac and vascular abnormality							
Congenital	472	452	484	495	483	537	531
Acquired	7,781	8,411	8,661	8,270	8,060	8,113	8,382
Pneumoconiosis							
with P.M.F.*	202	204	199	134	129	76	106
without	2,068	2,290	2,078	1,859	1,567	1,193	1,395

* P.M.F. = progressive massive fibrosis

Table C35. Persons undergoing Mass Miniature Radiography (M.M.R.), 1960 to 1966, England and Wales

(Estimates derived from 10 per cent sample)

(Figures in thousands)

Group	1960	1961	1962	1963	1964	1965	1966
Males							
General practitioner referrals	104.8	115.8	127.9	143.8	148.9	163.0	174.0
Hospitals, O.P., I.P.	7.6	8.8	6.9	8.4	9.9	9.9	11.7
Armed forces intake	29.1	1.1	0.7	0.6	0.6	0.8	0.7
School children	27.4	32.6	35.9	35.7	30.8	24.1	26.1
Contacts	19.7	17.0	22.9	27.2	38.6	36.1	35.9
Special surveys	36.1	16.9	5.8	5.5	2.3	3.9	5.7
Prisons, Borstals etc.	19.7	20.7	21.2	27.1	31.8	35.4	39.7
Factories, offices	1,195.7	1,164.2	1,188.2	1,211.7	1,214.8	1,144.4	1,136.0
Volunteers	389.4	425.5	455.0	433.2	426.4	448.7	425.6
Psychiatric hospitals	28.2	33.9	29.0	39.2	28.7	32.3	32.4
Females							
General practitioner referrals	89.8	102.8	106.6	119.8	124.3	129.6	139.2
Hospitals, O.P., I.P.	10.1	10.0	7.8	11.1	12.3	12.8	15.7
School children	22.2	28.5	29.6	27.8	26.1	20.6	20.8
Contacts	18.1	15.5	20.9	20.7	26.8	30.1	28.3
Special surveys	41.3	19.9	5.7	3.0	1.3	0.8	3.1
Prisons, Borstals etc.	2.2	3.5	3.3	5.0	6.9	7.0	8.3
Factories, offices	584.9	606.0	602.4	620.2	621.7	603.3	599.6
Volunteers	455.8	503.5	527.1	490.4	486.5	508.8	509.2
Ante-natal clinics	21.4	21.0	20.8	20.0	20.4	19.8	15.7
Psychiatric hospitals	28.3	32.0	27.5	39.8	27.3	32.2	33.3

Table C36. Respiratory tuberculosis. Proportion of M.M.R. examinations revealing cases requiring treatment or supervision (*per thousand examinations*), 1960 to 1966, England and Wales

Group	1960	1961	1962	1963	1964	1965	1966
Males							
All groups	1.8	1.7	1.5	1.5	1.5	1.3	1.2
General practitioner referrals	10.1	9.4	7.8	6.7	6.8	5.3	4.7
School children	0.9	0.7	0.6	0.9	0.6	0.6	0.5
Contacts	3.7	3.5	3.3	2.9	2.4	1.6	1.7
Prisons, Borstals etc.	4.6	3.9	3.4	3.9	3.8	3.3	2.8
Factories, offices	1.0	1.0	0.9	0.9	0.9	0.8	0.7
Volunteers	1.5	1.4	1.2	1.3	1.1	1.0	1.0
Psychiatric hospitals	3.0	2.6	1.8	2.2	1.6	1.4	1.2
Females							
All groups	1.3	1.0	1.0	0.9	0.9	0.8	0.7
General practitioner referrals	5.6	4.3	4.0	3.4	3.4	2.7	2.6
School children	1.3	0.7	0.9	1.2	0.7	0.9	0.8
Contacts	3.1	2.1	1.7	1.9	1.4	1.1	1.6
Prisons, Borstals etc.	1.8	0.6	1.5	0.8	1.3	2.6	0.5
Factories, offices	0.9	0.7	0.6	0.6	0.5	0.4	0.4
Volunteers	1.0	0.8	0.7	0.6	0.6	0.6	0.4
Ante-natal clinics	2.0	1.2	1.8	1.2	1.9	1.0	1.2
Psychiatric hospitals	0.8	0.9	0.9	1.0	0.6	0.7	0.5

Table C37. Mass miniature radiography, number of examinations made by mass radio-
(The total numbers of examinations have been derived from a 10 per cent sample of

Category of person examined	Males											
	Under 14	14	15-	20-	25-	35-	45-	55-	60-	65 and over	Not stated	All ages
Out-patients and in-patients of hospitals	80	50	720	810	1,760	2,030	1,960	1,320	1,110	1,840	-	11,680
H.M. Forces intakes	-	10	440	160	60	20	20	-	-	-	-	710
School children (Mantoux test)	4,080	2,480	1,410	80	-	-	-	-	-	-	-	8,050
School children (School groups)	980	3,270	13,680	120	-	-	-	-	-	-	-	18,050
Contacts (Mantoux test)	570	160	270	40	160	480	260	10	10	60	-	2,020
Other contacts	2,520	1,360	5,080	4,490	5,680	5,130	4,840	1,970	1,480	1,360	-	33,910
Persons covered by special surveys	20	-	470	430	1,460	1,250	1,080	460	360	180	-	5,710
Persons in prisons, borstals etc.	130	200	10,060	8,190	7,460	3,730	3,870	1,600	1,290	3,170	10	39,710
Persons in factories/offices (General surveys)	-	340	116,560	142,700	242,540	244,050	223,170	92,050	61,230	13,260	70	1,135,970
General public volunteers	1,390	1,560	34,560	41,530	84,650	90,060	74,590	32,980	26,700	37,560	10	425,590
Ante-natal cases	-	-	-	-	-	-	-	-	-	-	-	-
Psychiatric hospitals	360	140	1,260	2,160	3,880	5,900	7,000	3,530	2,900	5,230	10	32,370
Total	10,130	9,570	184,510	200,710	347,650	352,650	316,790	133,920	95,080	62,660	100	1,713,770
Persons referred by general practitioners	3,060	1,190	13,640	14,890	29,940	30,830	30,390	16,470	16,650	16,940	-	174,000
Total (all groups)	13,190	10,760	198,150	215,600	377,590	383,480	347,180	150,390	111,730	79,600	100	1,887,770

graphy units by sex, age and category of person examined, 1966, England and Wales
(record cards)

Category of person examined	Females												Persons All ages	Category of person examined
	Under 14	14	15-	20-	25-	35-	45-	55-	60-	65 and over	Not stated	All ages		
Out-patients and in-patients of hospitals	50	40	1,080	1,180	2,770	3,160	2,920	1,160	1,160	2,140	-	15,660	27,340	Out-patients and in-patients of hospitals
H.M. Forces intakes	-	-	30	10	-	-	-	-	-	-	-	40	750	H.M. Forces intakes
School children (Mantoux test)	3,930	2,320	980	10	-	-	-	-	-	-	-	7,240	15,290	School children (Mantoux test)
School children (School groups)	1,040	2,240	10,110	210	-	-	-	-	-	-	-	13,600	31,650	School children (School groups)
Contacts (Mantoux test)	590	210	430	80	290	660	310	10	20	30	-	2,630	4,650	Contacts (Mantoux test)
Other contacts	3,010	1,110	5,280	2,560	3,150	4,300	3,450	1,190	710	860	10	25,630	59,540	Other contacts
Persons covered by special surveys	30	-	420	350	520	760	580	240	110	120	-	3,130	8,840	Persons covered by special surveys
Persons in prisons, borstals etc.	20	10	910	840	710	560	780	330	380	3,760	-	8,300	48,010	Persons in prisons, borstals etc.
Persons in factories/offices (General surveys)	-	140	135,020	111,570	90,930	110,860	103,060	32,730	11,260	3,960	40	599,570	1,735,540	Persons in factories/offices (General surveys)
General public volunteers	1,290	1,130	45,600	46,200	100,970	113,660	93,420	38,680	31,190	37,010	30	509,180	934,770	General public volunteers
Ante-natal cases	-	10	2,310	5,410	6,610	1,290	50	-	-	-	10	15,690	15,690	Ante-natal cases
Psychiatric hospitals	180	60	1,460	1,530	2,990	4,630	6,260	3,200	3,190	9,760	30	33,290	65,660	Psychiatric hospitals
Total	10,140	7,270	203,630	169,950	208,940	239,880	210,830	77,540	48,020	57,640	120	1,233,960	2,947,730	Total
Persons referred by general practitioners	2,546	830	14,580	14,910	25,890	25,720	22,250	10,710	8,410	13,320	-	139,160	313,160	Persons referred by general practitioners
Total (all groups)	12,680	8,100	218,210	184,860	234,830	265,600	233,080	88,250	56,430	70,960	120	1,373,120	3,260,890	Total (all groups)

Introduction

When a doctor or coroner certifies a death he must specify at least one cause. Commonly, several diagnoses or causes of death are specified and one of these is stated as the underlying cause. For mortality analysis only the underlying cause of death is used and sometimes during coding this is altered according to rules laid down by the World Health Organization which are used by all member countries*. The remaining diagnoses not included in the selected underlying cause are discarded. Considerable interest has developed during the last 50 years about the causes of death on a certificate which are discarded in this way. Certain diseases such as asthma, diabetes, rheumatic disease and thrombotic diseases have often contributed to a death but are not recorded, so that the prevalence of these diseases among the persons who die cannot be measured.

Attempts to study these conditions have been made from time to time at the General Register Office/ but the problems of analysing such data using conventional punch card techniques have proved cumbersome and expensive. The development of data processing methods using computers has now made analysis more practicable.

Methods

The General Register Office started a fresh study in 1966 of multiple causes of death. However, with limited resources available, it was decided to confine the study to a sample of deaths each year. The sample has been drawn month by month during the whole of 1966, and a similar sample will be drawn in subsequent years.

The method of sampling was as follows:-

- (a) A copy of every entry made by every registrar is sent to the General Register Office.
- (b) The copies are bound into volumes according to place of death.
- (c) One copy in every twenty was photographed.
- (d) Sampling from each volume was started at a page between 1 and 20.
- (e) The starting page was taken from a list of random numbers.

This sample yielded 5 per cent of all deaths, that is about 1,200 certificates for persons aged under 15 years and about the same number for persons aged between 15 and 44. For deaths between the ages of 45 and 64 the sample was sub-sampled by one in five to give a 1 per cent sample of all the deaths in this age-group. For the deaths in persons aged 65 years and over a one in ten sub-sample was taken giving a final 0.5 per cent sample of all deaths in the age-group. Each of these age-groups yielded between 1,000 and 2,500 certificates in the final sample during the whole year.

* Manual of the International Classification of Diseases, Injuries, and Causes of Death
 / Statistical Review of England and Wales, 1951, Part III, page 250
 Statistical Review of England and Wales, 1954, Part III, page 159

The general method of coding was as follows:

- (i) The diagnoses on certificates were divided into separate conditions. Each condition was then assigned to an ICD (7th Revision) category by using the Index to ICD. Sub-division of phrases was made wherever there was 'and', 'with', 'due to' or 'following', wherever a disease was referred to two sites and wherever a general disease and local condition were implied in one phrase. Sometimes a name or an adjective implied a second simultaneously or previously present disease in which case both diseases were coded, e.g. emphysematous bronchitis.
- (ii) All symptoms and ill-defined causes were coded if possible.
- (iii) All repetitions of any code due to use of synonyms in diagnosing were coded and were indicated as repetitions so that only one entry of a particular code was counted in any one certificate.
- (iv) All 'E' and 'N' causes (accidents, poisonings and violence) were coded.
- (v) When acute and chronic forms of the same illness were mentioned and had separate ICD categories they were coded to each class.
- (vi) All sites for tumours or injuries were coded individually.
- (vii) Up to nine diagnoses were allowed altogether. Where there were more than nine diagnoses present, as in some of the accidental deaths, the diagnoses were reduced to nine by selecting the most serious injuries in the major areas.

A number of disease names were found to be uncodable. These were often due to bad writing or spelling on the part of the certifying doctor or registrar and many applied to new-born babies and very young children. These terms required expert interpretation and decisions were made arbitrarily by a team of doctors and coders. The coded data was stored on magnetic tape which is available for the yearly tabulations and for special studies.

Results

The numbers of certificates included in each age-group in the 1966 multiple cause analysis sample are shown below.

		Under 15	15-	45-	65 and over
Certificates in sample	M	592	682	882	935
	F	444	464	461	1,074
Actual deaths recorded	M	12,449	14,539	80,710	180,924
	F	8,926	8,695	45,239	212,142
Sampling fraction achieved	M	4.7544	4.6908	1.0928	0.5168
	F	4.9742	5.3364	1.0190	0.5063
Multiplying factor	M	21.0287	21.3182	91.5079	193.5016
	F	20.1036	18.7392	98.1323	197.5251

The actual sampling fractions achieved are close to the fractions which were aimed at. The observed number of cases for a given age-group with a specific underlying cause was compared with an 'expected' number by taking the appropriate fraction of the total deaths for that cause and age-group from the yearly routine underlying cause mortality tabulations (*Registrar General's Statistical Review, Part I, Tables, Medical*). The frequency of significant differences was not higher than would be expected by chance and showed that the sampling method had been fairly carried out. It is therefore valid to make estimates from the results of the sample of all deaths in England and Wales for 1966.

Table C40 shows results from the sample for selected causes of death. The total mentions (number in sample) of certain diagnoses and the mentions as underlying cause have been counted. The ratio of the latter to the former indicates the degree of selection of certain diagnoses in conventional mortality coding by underlying cause. A number of factors determine the magnitude of this ratio. They start with the judgment of the doctor who writes diagnoses in a particular sequence stating conditions which have culminated in an underlying cause. Some coding rules exist which permit coders to alter the order of diagnoses where a doctor has written an 'unacceptable' sequence and the nature of some conditions leading to death results in their seldom appearing as underlying cause. For example, venous embolic disease is commonly a consequence of other underlying disease. Similarly, rheumatoid arthritis is commonly only an accompaniment of other disease and not regarded as an underlying cause. Any one of these factors may operate in favouring the choice of one diagnosis rather than another as underlying cause.

Table C41 shows the estimated total number of mentions of selected diagnoses on death certificates in the one year (1966). This estimate is derived from the sample. The number of deaths in which the selected diagnoses were designated as underlying causes is also shown. In Table C42 the same values are expressed as rates. These tables, and particularly Table C42, show clearly how overall frequency of occurrence of some diseases can be deduced from the number of deaths for which they are the underlying cause. Examples of these are malignant neoplasm of the lung in men and coronary heart disease in men. In other cases however, no such deduction can be made. As Table C42 shows the prevalence of hypertension and pulmonary infarction is higher than the rate of the same diseases expressed as underlying causes. The same can be said of diabetes in older persons, of coronary heart disease in middle-aged women and of pyelonephritis in old men.

This analysis is from a stratified sample for one year. However, the overall results are remarkably similar to those obtained with previous studies. Table C43 shows comparisons between these studies.

Table C40. Multiple cause coding study. Total number of mentions in the sample and the number taken as the underlying cause for selected diagnoses, by sex and age, 1966, England and Wales

ICD No.	Cause		Mentions of diagnoses in sample											
			0-			15-			45-			65 and over		
			Total mentions (a)	As underlying cause (b)	Ratio (b/a x 100)	Total mentions (a)	As underlying cause (b)	Ratio (b/a x 100)	Total mentions (a)	As underlying cause (b)	Ratio (b/a x 100)	Total mentions (a)	As underlying cause (b)	Ratio (b/a x 100)
162.1	Malignant neoplasm of bronchus and lung specified as primary	M F	- -	- -	- -	19 4	19 4	100 100	82 11	80 10	98 91	43 5	41 4	95 80
241	Asthma	M F	3 2	2 1	67 50	20 19	17 17	85 89	10 4	2 2	20 50	5 9	1 4	20 44
260	Diabetes mellitus	M F	2 -	2 -	100 -	9 7	7 3	78 43	27 14	6 5	22 36	20 44	6 13	30 30
330	Subarachnoid haemorrhage	M F	- 1	- -	- -	10 24	8 24	80 100	9 8	9 8	100 100	3 5	3 5	100 100
331	Cerebral haemorrhage	M F	5 1	4 -	80 -	20 20	13 11	65 55	39 39	33 32	85 82	63 89	54 81	86 91
332	Cerebral embolism and thrombosis	M F	1 3	- -	- -	10 6	3 1	30 17	30 22	25 12	83 55	92 139	76 111	83 80
334	Other and ill-defined vascular lesions of central nervous system	M F	2 6	- 1	- 17	5 2	- 1	- 50	10 9	4 4	40 44	39 63	22 36	56 57
410	Disease of mitral valve	M F	- -	- -	- -	8 15	8 10	100 67	7 12	6 11	86 92	7 11	2 6	29 55
420.1	Heart disease involving coronary arteries	M F	- 1	- 1	- 100	125 18	120 14	96 78	273 90	260 85	95 94	218 213	192 192	88 90
444	Essential benign hypertension	M F	1 1	- -	- -	23 18	1 2	4 11	73 43	8 2	11 5	74 86	3 6	4 7
465	Pulmonary embolism and infarction	M F	- -	- -	- -	15 20	1 1	7 5	14 16	4 3	29 19	22 27	4 4	18 15
466	Other venous embolism and thrombosis	M F	- 2	- -	- -	7 10	2 5	29 50	5 7	1 6	20 86	5 15	4 7	80 47
491	Bronchopneumonia	M F	80 58	56 36	70 62	26 26	5 6	19 23	96 43	20 7	21 16	173 189	53 86	31 46
592	Chronic nephritis	M F	- -	- -	- -	8 1	6 -	75 -	3 2	1 -	33 -	3 1	2 1	67 100
593	Nephritis not specified as acute or chronic	M F	4 7	1 1	25 14	11 18	4 3	36 17	16 13	2 2	13 15	10 6	2 1	20 17
600.0	Pyelitis pyelocystitis and pyelonephritis	M F	5 2	1 -	20 -	2 12	1 10	50 83	4 6	2 4	50 67	12 12	4 5	33 42
722.0	Rheumatoid arthritis	M F	- -	- -	- -	1 1	1 1	100 100	7 3	2 -	29 -	2 15	1 2	50 13
723.0	Osteo-arthritis (arthrosis)	M F	- -	- -	- -	- -	- -	- -	2 -	1 -	50 -	3 5	- -	- -
723.1	Spondylitis osteo-arthritis (spondylarthrosis)	M F	- -	- -	- -	- -	- -	- -	- -	- -	- -	4 -	1 -	25 -
792.0	Uraemia	M F	6 1	- -	- -	18 16	2 -	11 -	10 8	1 -	10 -	25 13	- -	- -
N961	Poisoning by alcohol	M F	- -	- -	- -	9 1	1 -	11 -	- -	- -	- -	1 -	- -	- -
N968	Poisoning by carbon monoxide	M F	1 2	1 2	100 100	22 16	21 16	95 100	8 2	8 2	100 100	3 6	3 6	100 100
N971	Poisoning by barbituric acid and its derivatives	M F	- -	- -	- -	16 20	15 20	94 100	2 5	2 5	100 100	1 2	1 2	100 100
N972	Poisoning by aspirin and salicylates	M F	- -	- -	- -	3 -	1 -	33 -	1 -	1 -	100 -	- -	- -	- -
N974	Poisoning by other analgesic and soporific drugs	M F	- -	- -	- -	3 3	3 3	100 100	- -	- -	- -	1 -	1 -	100 -
N979	Poisoning by other and unspecified substances	M F	- 1	- 1	- 100	3 2	2 1	67 50	- -	- -	- -	- -	- -	- -

Table C41. Multiple cause coding study. Number of mentions in the sample, estimated* total number of mentions and the total number taken as the underlying cause† for selected diagnoses, by sex and age, 1966, England and Wales

ICD No.	Cause		0-			15-			45-			65 and over		
			From sample		From Stat. Review	From sample		From Stat. Review	From sample		From Stat. Review	From sample		From Stat. Review
			Number	Estimated total for year	As underlying cause	Number	Estimated total for year	As underlying cause	Number	Estimated total for year	As underlying cause	Number	Estimated total for year	As underlying cause
162.1	Malignant neoplasm of bronchus and lung specified as primary	M	-	-	1	19	405	404	82	7,504	7,415	43	8,321	7,765
		F	-	-	-	4	75	133	11	1,079	1,278	5	988	1,558
241	Asthma	M	3	63	67	20	426	262	10	915	324	5	968	254
		F	2	40	50	19	356	289	4	393	429	9	1,778	365
260	Diabetes mellitus	M	2	42	9	9	192	102	27	2,471	402	20	3,870	999
		F	-	-	12	7	131	68	14	1,374	459	44	8,691	2,250
410.0	Diseases of mitral valve	M	-	-	4	8	171	194	7	641	575	7	1,355	457
		F	-	-	2	15	281	297	12	1,178	1,181	11	2,173	1,320
420.1	Heart disease involving coronary arteries	M	-	-	1	125	2,665	2,151	273	24,982	25,608	218	42,183	41,036
		F	1	20	3	18	337	302	90	8,832	6,720	213	42,073	37,246
444	Essential benign hypertension	M	1	21	-	23	490	27	73	6,680	367	74	14,319	844
		F	1	20	-	18	337	10	43	4,220	192	86	16,987	1,496
465	Pulmonary embolism and infarction	M	-	-	1	15	320	29	14	1,281	294	22	4,257	656
		F	-	-	1	20	375	49	16	1,570	242	27	5,333	957
600.0	Pyelitis, pyelocystitis and pyelonephritis	M	5	105	18	2	43	69	4	366	259	12	2,322	883
		F	2	40	14	12	225	118	6	589	337	12	2,370	1,516

* For sampling factor see page

† Figures as published in the Registrar General's Statistical Review, Part I, 1966.

Table C42. Multiple cause coding study. Estimated rate of occurrence* of the total mentions and of the mentions taken as underlying cause† (for selected diagnoses shown in Table C41), by sex and age, 1966, England and Wales

ICD No.	Cause		0-		15-		45-		65 and over	
			Estimated	Underlying cause	Estimated	Underlying cause	Estimated	Underlying cause	Estimated	Underlying cause
162.1	Malignant neoplasm of bronchus and lung specified as primary	M	-	0.18	41.7	41.6	1,300	1,285	3,707	3,459
		F	-	-	7.96	14.1	174	206	269	424
241	Asthma	M	11.1	11.8	43.9	27.0	159	56.1	431	113
		F	7.42	9.28	37.8	30.7	63.5	69.3	484	99.3
260	Diabetes mellitus	M	7.41	1.59	19.8	10.5	428	69.7	1,724	445
		F	-	2.23	13.9	7.22	222	74.1	2,364	612
410.0	Diseases of mitral valve	M	-	0.71	17.6	20.0	111	99.6	604	204
		F	-	0.37	29.8	31.5	190	191	591	359
420.1	Heart disease involving coronary arteries	M	-	0.18	274	222	4,329	4,438	18,793	18,282
		F	3.71	0.56	35.8	32.0	1,426	1,085	11,443	10,130
444	Essential benign hypertension	M	3.71	-	50.5	2.78	1,158	63.6	6,379	376
		F	3.71	-	35.8	1.06	681	31.0	4,620	407
465	Pulmonary embolism and infarction	M	-	0.18	33.0	2.99	222	50.9	1,897	292
		F	-	0.19	39.8	5.20	253	39.1	1,450	260
600.0	Pyelitis, pyelocystitis and pyelonephritis	M	18.5	3.18	4.43	7.11	63.4	44.9	1,034	393
		F	7.42	2.60	23.9	12.5	95.1	54.4	645	412

* Expressed as a number per million of live population of the age-group quoted.

† From the Registrar General's Statistical Review, Part I, 1966.

Table C43. Comparison of multiple cause coding studies for selected diagnoses, 1951, 1958 and 1966, England and Wales

ICD No.	Cause	WHO Group 1951 Study* (10 per cent sample)			WHO Group 1958 Study (10 per cent sample)			GRO Study 1966 (1 per cent sample) men and women aged 45-64 years					
		Mentions of diagnosis											
		Total mentions (a)	As under-lying cause (b)	Ratio ($\frac{b}{a} \times 100$)	Total mentions (a)	As under-lying cause (b)	Ratio ($\frac{b}{a} \times 100$)	Total mentions (a)	As under-lying cause (b)	Ratio ($\frac{b}{a} \times 100$)	Total mentions (a)	As under-lying cause (b)	Ratio ($\frac{b}{a} \times 100$)
		Persons			Persons			Males			Females		
332	Cerebral embolism and thrombosis	2,138	1,678	78	2,169	1,757	81	30	25	83	22	12	55
334	Other ill-defined vascular lesions of central nervous system	483	261	54	612	302	49	10	4	40	9	4	44
420.1	Arteriosclerotic heart disease involving coronary arteries	3,420	3,144	92	4,279	3,989	93	273	260	95	90	85	94
454	Arterial embolism and thrombosis	25	11	44	8	3	38	2	0	-	1	-	-
463	Phlebitis and thrombo-phlebitis of lower extremities	31	16	52	15	10	67	-	-	-	2	1	50
464	Phlebitis and thrombo-phlebitis of other sites	19	1	5	7	2	28	1	0	-	-	-	-
465	Pulmonary embolism and infarction	262	32	12	377	51	14	14	4	29	16	3	19
466	Other venous embolism and thrombosis	95	25	26	179	44	25	5	1	20	7	6	86

* Registrar General's Statistical Review of England and Wales, 1951, Text volume, p. 250

Therapeutic misadventures and other complications of medical care

This subject is of importance not only to those engaged in medical practice, but also to all concerned with the policies and ethics of medicine. It is a matter where statistical evaluation is peculiarly hazardous, both from difficulties in the collection of the basic data and from the imprecision of the concepts.

The basis of the data is provided by death certificates from doctors or by death reports from coroners; it is supplemented by additional information resulting from biopsy or autopsy or from replies to medical enquiries addressed to the certifier. The underlying cause of death is selected and coded according to the International Classification of Diseases (ICD). However, interpretation of the certificate depends considerably upon the amount of information available, and upon the terms in which it is couched.

The medical certificate of cause of death asks not only for the disease directly leading to death, but also for other significant contributory conditions. There is no necessity to enter conditions such as pregnancy or operation or other therapy unless the certifier believes that such conditions contributed in some way to death.

In this difficult field of demarcation even the material to be surveyed is not clearly defined. There can be dispute as to what is a drug, either between general practitioners and local executive councils, or between pharmacists and herbalists. It is obviously desirable that if there is any reasonable doubt the incident should be put on record, to alert the medical profession and allied industry to potential dangers.

When consulting the tables of individual misadventures, this last point should be kept in mind and conclusions tempered with due reserve. An isolated instance may be a fortuitous coincidence. Again, if several therapeutic procedures are mentioned in connection with one fatality, innocent procedures will be included as well as the responsible ones. It is the accumulation of cases of the same kind that is important; and it is any increase in the number of cases of the same kind that indicates potential dangers for the future which need urgent attention.

It has been customary since 1958 to present a detailed list of individual deaths, reporting the statements on the death certificate, but maintaining anonymity concerning the deceased person. The detailed lists may disguise salient facts by their very fullness and, therefore, summary tables have been prepared to condense the record into a more comparable form for recognising trends (see Table C44).

A review took place in 1953 (see page 220 of the Commentary Volume, Part III of the *Statistical Review* for that year) of the coding of coroners' reports. Another factor affecting comparability of statistics was introduced between 1957 and 1958 with the adoption of the seventh revision of the ICD, although no overt change took place in the content of the categories concerned. The effect of these two changes can be illustrated by the fluctuations in numbers recorded for category E950 'Therapeutic misadventures in surgical treatment'.

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Deaths										
E950:	1	3	28	54	43	41	37	7	7	1

A decision was taken in 1956 (see Commentary for that year) to exclude pulmonary embolism or pulmonary oedema following operation from the count of therapeutic misadventures if the condition for which treatment was given is known, but no appreciable change is apparent in the figures (1956 = 1,031 deaths; 1957 = 1,051 deaths). This is a condition which has been intensively studied recently, along with other forms of embolism and thrombosis, in relation to the effects of drugs, and for which the recorded number of assigned deaths has doubled in the past decade possibly due to changes in diagnostic methods.

An example of the sensitivity of statistics of therapeutic misadventure to extraneous influences was provided on the occasion of the change-over from mechanical processing of the data to computer processing at the General Register Office. For part of the year new coders on the computer site and coders in another part of the country were both scrutinizing records for any mention of therapeutic implication in death. Together they found a record number - 20 per cent higher than either the year before or the year after. This is illustrated in Table C89 of the *Statistical Review Commentary* for 1965.

Table C44. Deaths assigned to therapeutic misadventures and complications of non-therapeutic procedures, 1956 to 1966, England and Wales

ICD E Code	1956-66											1956-66		
	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	M	F	
	Therapeutic misadventures (as underlying cause)													
950	Surgical treatment	41	37	7	7	1	8	5	2	4	8	1	64	57
951	Infusion or transfusion	-	4	1	2	3	2	3	3	2	10	9	18	21
952	Local application	1	-	1	1	-	1	-	3	2	1	2	3	9
953	Administered drugs or biologicals	2	4	2	4	1	4	9	11	21	29	29	53	63
954	Anaesthesia	1	2	-	-	-	2	1	-	1	3	2	6	6
955	Other and unspecified therapy	5	2	1	3	1	3	2	2	-	3	2	15	9
956-959	Late effects of therapy	-	2	1	1	1	-	1	3	-	-	1	5	5
950-959	All forms of therapeutic misadventure	50	51	13	18	7	20	21	24	30	54	46	164	170
	Complications of non-therapeutic procedures (as underlying cause)													
940-944	Complications of prophylactic inoculation	8	11	12	2	7	9	12	1	4	7	8	46	35
946	Other medical and surgical procedures	-	2	-	1	3	-	-	1	1	2	2	2	10

Deaths assigned to complications of therapy

These counts of deaths assigned to E950-E959, in which the certifier has failed to provide a satisfactory underlying cause of death, are inadequate by themselves; in recent years they have all been included in the special tabulations covering any mention of therapeutic misadventure, whether assigned to another underlying cause or not. To take one group as an example:

Anaesthetic therapeutic misadventures:	1957-1958	1959	1960	1961	1962	1963	1964	1965	1966
Assigned to ICD E954	2	-	-	2	1	-	1	3	2
Total discovered	10	4	-	4	1	1	2	9	13

Bearing in mind the incomplete count of deaths assigned to therapeutic misadventures (E950-E959), the changes in numbers over the past few years can be briefly reviewed. After an abrupt drop in 1958 (Table C44), to almost one quarter of the value in the previous year, the number has climbed back to its original level. This increase in misadventures with no other underlying cause is in contrast to the decrease in mentions of operations as a contributory cause in death certificates.

The categories which show this increase most clearly are

- (a) drugs and biologicals administered for a therapeutic purpose (average in 1959-1961 was three, rising to 29 in 1965 and 1966)
- (b) infusions or transfusion for purposes of treatment and not attributable to the pre-existent condition (average in 1959-1961 was two, rising to 10 in 1965).

It is thus the relatively 'harmless' drug, rather than surgical interference that has given rise to this increase.

Deaths from complications of therapy assigned to underlying cause

Beginning in 1958-1959, a special search for all therapeutic misadventures was instituted and the result has been published annually in the Commentary Volume. Any death report certified by a medical practitioner in which there is mention of operation is already counted in Appendix H5 of the *Statistical Review Part I*. For any of these to be assessed as a therapeutic misadventure there must have been some mishap which was not foreseen and does not normally occur, such as slipping of a ligature, or perforation of an internal organ. The criterion for inclusion has nothing at all to do with any question of negligence, but picks out incidents which deserve fuller study so as to prevent similar occurrences in the future.

In the same way search is made for any other therapeutic procedure, especially drug therapy or radiotherapy. Any mention of drug administration can bring it into the class of 'Therapeutic Misadventure' if there is also mention of

- (a) adverse effect of drug, i.e. an action not normally expected of the drug;

- (b) 'overdose', with the implication that the drug had been prescribed for therapeutic purposes;
- (c) wrong drug administered; or
- (d) accident of technique.

Overdose incidents are subdivided according to whether the drug was self-administered, medically administered or of unstated administration; these terms are rather loose, and the word 'overdose' may in ordinary usage be applied to accidental poisoning or attempted suicide.

The disputed borderline is reached when one advances beyond operative damage and ill-effects of drugs. If fibrosis of the lungs is a well-recognized hazard and an accepted risk of radiotherapy for breast or chest, should it be branded as a misadventure? If pulmonary embolism is no longer considered inevitable, but is now known to be preventable when precautions are taken, why should it be excluded from the misadventures? Whether these deaths are included in one table or another is immaterial, provided that one is aware of their occurrence, and that they are recorded with sufficient distinctness so that their behaviour can be charted. The choice of the coding category or printed table may be limited by international agreements or administrative decisions: the choice whether to ignore individual deaths as coincidences, or to study them with a view to reducing their incidence, is a more important decision.

The coverage of therapeutic misadventures in Table C44 is not exclusive. To some extent it overlaps the deaths with mention of operation (Appendix H5) or anaesthesia (Appendix H3) if they happen to fall into the category of misadventure, as defined above: it also overlaps deaths from poisoning. But the table excludes some deaths which might possibly be considered therapeutic misadventures. These exclusions cover among other possibilities:-

- (a) pulmonary embolism following operation
- (b) paralytic ileus following operation
- (c) infections such as tetanus, gas gangrene, erysipelas or septicaemia following operation
- (d) overdose or adverse effects of drugs, if a verdict of suicide has been returned
- (e) air embolism following abortion, not otherwise specified.

Although there are close on 2,000 deaths annually assigned to pulmonary embolism, such evidence as we have suggests that the number following operation is small. As a special exercise all deaths from paralytic ileus in a single recent year were individually scrutinized (a much smaller task than examining the embolisms); in none of the seven cases of death with mention of operation was there any suggestion of misadventure. Details are given on page 105. Each year deaths due to tetanus are reported (Appendix H2). Recently gas gangrene, following operations on the hip and abdomen, has been studied. However, as the thalidomide incident demonstrated, a watch needs to be maintained for new forms of adverse effects possibly arising in unexpected quarters.

Operations

In a considerable number of deaths the performance of an operation is mentioned on the death certificate. The numbers in recent years (excluding coroners' cases) have been:

	Males	Females
1957	5,047	4,602
1958	5,134	4,768
1959	4,863	4,625
1960	4,615	4,362
1961	4,338	4,228
1962	4,357	4,022
1963	3,822	3,785
1964	3,350	3,550
1965	3,239	3,423
1966	3,240	3,250 (71% of 1957)

The disease conditions most often mentioned are shown in Table C45.

Table C45. Principal conditions to which death was assigned for certificates on which operation was mentioned, 1957 to 1966, England and Wales

	Persons										1966 as a percentage of 1957
	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	
Malignant neoplasms	6,235	6,531	6,160	5,733	5,544	5,271	5,003	4,639	4,506	4,302	69
Peptic ulcer	588	529	477	467	408	447	303	276	269	277	47
Hyperplasia of prostate	773	743	731	685	587	536	428	391	311	323	42
Intestinal obstruction and hernia	425	443	403	382	411	425	344	337	303	309	73
Benign and unspecified neoplasms	139	99	118	109	93	85	72	78	62	65	47
Gastro-enteritis	138	138	146	173	151	151	142	120	126	122	88
Appendicitis	125	123	107	96	102	76	65	63	50	44	35

Over the past ten years the number of death certificates (not being coroners' cases) in which an operation was stated to have contributed to death has decreased by nearly one third. When some of the largest individual groups are considered, it is seen that the decrease has been much greater for some diseases - nearly two thirds for appendicitis and more than 50 per cent for peptic ulcer and hyperplasia of the prostate. These are presumably operations in which consolidation and improvement of techniques have been most effective; other areas where new operations are being developed would not be expected to show so regular a decrease in mortality. The possibility of this regular decrease being due to changes in certifying habits is

rendered unlikely by the existence of unequal changes in different conditions and by corroboration that all deaths from these diseases are becoming fewer.

Death associated with anaesthesia nearly always leads to an enquiry by a coroner; these deaths have decreased over the same period to an even greater extent - by almost 50 per cent (see Table C49a)

Preventable deaths from adverse reactions

Although death from adverse reaction to therapy is regrettable, in many cases regret is tempered by knowledge that death would soon have occurred whatever therapy had been employed. This is true for malignant disease, senility and other serious illnesses. It is impossible to say, from many of the reports, whether this would be true or not; but for a small minority it seems that death was not expected, and might have been avoided.

A solution to this problem can be sought along two separate avenues of approach. The first is from the list of therapeutic misadventures, from which it is possible to pick out individuals who *prima facie* would not have been expected to die from the disease to which their death is ascribed.

There are first of all illnesses not normally attended with any mortality. Two examples can be given from the list -

Impetigo, treated with chloramphenicol and terminated by aplastic anaemia and cerebral haemorrhage.

Vasomotor rhinitis, for which a steroid was given, the patient dying with cortical necrosis of (adrenal ?) and subarachnoid haemorrhage.

There are also operations which one normally expects patients to survive - Circumcision, for which ether was used, followed by cardiac arrest.

Caesarean section (no complications mentioned), the patient being anaesthetized with pentothal along with scoline, and dying from respiratory failure.

Hernia (either inguinal, or not stated). One patient received 'nitrous oxide' which turned out to be nitrogen dioxide; the other received halothane. One died with acute pulmonary oedema, the other with acute liver necrosis.

A dental patient received nitrous oxide anaesthesia with oxygen and halothane, and died from anaphylactic shock.

There may have been other reasons, omitted from the reports, to explain why these patients died.

A second line of approach is by the study of routine mortality tabulations - quite independently of any mention of therapy or therapeutic misadventure - which show death from conditions which should not be causing death. Examples of these are set out in Table C46. The diagnoses in these cases may possibly be incomplete, or even inaccurate or misleading; other conditions may be present - advanced age or other serious conditions - which contributed to death; they may in fact already be included in the lists of therapeutic misadventures. Taken as they stand, they call for fuller enquiry.

Table C46. Deaths from causes which merit further investigation

ICD Category	1961	1962	1963	1964	1965	1966
021 Early syphilis	1	-	-	-	-	-
030 Acute (or unspecified) gonorrhoea	-	-	1	2	1	3
213,220) Benign neoplasm of skin 221,222) or breast	6	2	-	2	1	1
226 Lipoma	6	3	4	2	5	9
240 Hay fever	1	1	1	-	-	-
384 Strabismus	3	3	-	1	2	1
385 Cataract, in persons under 65 years of age	3	3	-	-	2	4
460 Varicose veins of lower limbs, in persons under 45 years of age	11	15	13	6	7	11
470 Acute nasopharyngitis (common cold)	6	13	12	1	2	4
510 Hypertrophy of tonsils and adenoids	16	22	13	6	12	8
530 Dental caries	4	-	-	-	1	-
615 Redundant prepuce and phimosis	8	7	3	3	2	4
740 Bunion	2	4	2	-	3	4
747 Hallux valgus and varus	2	2	2	1	2	2
765 Ophthalmia neonatorum	-	-	-	1	-	-
790 Nervousness and debility	1	1	-	3	-	2

Removal of tonsils and adenoids

One operation - the most frequently performed of all - has received close attention. The decrease in the recorded number of deaths after tonsillectomy and adenoidectomy has been so pronounced that doubts have been voiced about its authenticity.

In view of the interest in this subject, the data are summarized below, as far as detailed records exist. Deaths assigned annually to 'Hypertrophy of tonsils and

adenoids' amounted to more than 60 twenty years ago, but have fallen to less than 10 in some recent years. In close on 90 per cent of these deaths an operation is mentioned. Information on the number of patients is available, but re-admissions are included as are discharges without operation; in addition operations performed in general surgical wards and elsewhere are excluded. The Hospital In-patient Enquiry sample provides an estimate of operations performed, but only those performed on in-patients who are in NHS hospitals and not those performed on private patients.

'T's and A's' are performed more frequently on children between the ages of 5 and 10 years. It is therefore understandable that the peak number of births in 1947 should give rise to a peak number of T's and A's - just over a quarter of a million - in 1954 (with 30 post-operative deaths). Only two thirds of that number of operations are performed today and the fatality ratio has fallen, rather irregularly, to half the level of 1954. All ages have shown this decrease in fatality ratio, and the hazard is much the same at all ages.

It is noteworthy that the fatality ratio tends to be lowest in years of influenza epidemicity (1957, 1959, 1961, 1963) and these are also years when the number of operations is below the average.

Deaths after tonsillectomy and adenoidectomy are rarely included among 'therapeutic misadventures', as no specific failure of technique occurs. Anaesthesia is mentioned in one quarter of the deaths between 1959-1963 but in only one death since then.

The outstanding cause of death after tonsillectomy is haemorrhage, mentioned in 55 per cent of deaths (1961-1962), or the consequent lung infection due to inhalation of blood. Bleeding may occur within a few days of operation, or may be delayed more than a week. A detailed examination of the clinical course in 93 deaths after tonsillectomy and adenoidectomy (reviewed by N. Tate in the Lancet, 1963, Vol. 2, p. 1090) indicated the danger of delay in arresting any haemorrhage, and the ineffectiveness of traditional sedative drugs.

The reduction in deaths from this operation can be seen as in small part due to increased safety in anaesthesia, but even more to prompt tackling of haemorrhage as soon as it occurs. This has been facilitated by the lessened pressure on ENT hospital beds and the ability to keep patients in hospital longer and to re-admit them speedily if required, and by discouraging the operation in hospitals in which doctors are not always available.

Paralytic ileus

A small number of deaths each year are coded to paralytic ileus. The fluctuation in numbers from year to year is greater than would be expected by chance.

Year	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
	14	27	16	25	17	25	43	22	30	32	51	35

(1958-1966 Mean = 28.1; Variance = 111.6; P < .01)

This suggests either that standards of coding to this category were not constant, or that other factors influencing the number of deaths recorded from this cause may be at work.

Table C47. Deaths assigned to hypertrophy of tonsils and adenoids (ICD No. 510), 1949 to 1966, England and Wales

Year	Number of deaths		Number at risk		Fatality ratio per 10,000 operations
	Assigned to ICD No. 510	Deaths after operation ICD No. 510.1	Estimated discharges from ENT (T & A) depts.	Estimated operations from HIPE	
	(thousands)				
1949	40				
1950	49	42			
1951	43	39			
1952	47	42			
1953	42	37	215	212	1.7
1954	33	30	263	258	1.2
1955	37	31	172	168	1.8
1956	29	27	211	207	1.3
1957	22	16	188	184	0.9
1958	35	33	201	197	1.7
1959	21	20	193	191	1.0
1960	17	16	206	204	0.8
1961	16	12	183	181	0.7
1962	22	21	194	192	1.1
1963	13	13	188	186	0.7
1964	6	3	196	194	0.2
1965	12	11			
1966	8	7			

Table C48. Post-operative deaths and fatality ratios, by age (ICD No. 510.1), 1950 to 1966, England and Wales

Year	Deaths after operation				Fatality ratios per 10,000 operations			
	Age				Age			
	0-	5-	15-	45-	0-	5-	15-	45-
1950	9	27	4	2				
1951	5	27	7	-				
1952	8	27	5	2				
1953	7	23	5	2				
1954	6	21	3	-				
1955	7	20	4	-				
1956	3	18	5	1				
1957	1	12	1	2	0.4	1.1	0.6	} 0.7
1958	4	25	4	-	1.3	1.9	1.7	
1959	2	17	-	1	0.8	1.3	-	
1960	3	11	2	-	1.1	0.8	0.8	
1961	5	5	2	-	1.8	0.4	0.8	
1962	1	18	2	-	0.3	1.4	0.8	
1963	3	10	-	-	1.1	0.9	-	
1964	2	1	-	-	0.7	0.1	-	
1965	-	11	-	-				
1966	2	3	2	-				

Of 51 deaths assigned to this underlying cause in 1965, an operation shortly before death was recorded in seven cases, but in only four was the nature of the operation recorded. These were -

laparotomy (two cases - M 81, M 41)

re-fashioning ileostomy for ulcerative colitis (M 37)

spina bifida (M 5)

There was one other child (F 3) in whose case spina bifida was mentioned, but no operation, and in 13 cases no other condition was recorded prior to the ileus; in three others senility was the only prior condition mentioned.

Among the conditions mentioned, which may have been responsible for the onset of ileus, were -

	Males	Females
Chronic bronchitis (3), emphysema	3	1
Abdominal disease: gastric ulcer, duodenal ulcer, cirrhosis of liver, acute pancreatitis, polycystic disease of kidneys	4	1
Circulatory disease: coronary thrombosis, myocardial infarction, auricular fibrillation (2), cerebral arteriosclerosis, cerebral thrombosis, hypertension	6	1

Table C49(a). Deaths connected with administration of anaesthetics, by sex 1957 to 1966, England and Wales

	Males	Females
1957	241	209
1958	205	204
1959	212	202
1960	165	179
1961	167	156
1962	161	125
1963	118	112
1964	115	138
1965	112	105
1966	114	112

Table C49(b). Deaths connected with administration of anaesthetics for diseases requiring operation (major groups), 1958 to 1966, England and Wales

	1958	1959	1960	1961	1962	1963	1964	1965	1966
Malignant neoplasm	75	74	71	70	59	44	48	44	48
Other neoplasms	16	11	8	11	5	1	12	4	9
Disease of teeth and supporting structures	9	9	9	6	3	11	6	4	6
Peptic ulcer	20	26	21	16	15	16	9	4	13
Appendicitis	18	14	4	11	11	8	7	-	6
Intestinal obstruction and hernia	37	47	35	34	30	19	16	19	13
Chronic enteritis and ulcerative colitis	4	7	10	10	3	4	4	4	3
Hyperplasia of prostate	29	25	18	10	17	10	6	10	13

Note. These are deaths in which anaesthesia was noted on the death certificate or coroner's report; they are not necessarily to be considered 'therapeutic misadventures'.

Anaesthesia for dental operations

The subject of deaths with mention of anaesthesia for dental operations was reviewed in the Commentary volume for 1963 (Part III, page 212) for the years 1958-1963.

The numbers of deaths in which mention was made both of dental operation and anaesthesia as the cause of, or contributing to the death are:

Age:	1961-1963		1964	1965	1966	1964-1966	
	M	F	Persons			M	F
0-	-	-	-	-	-	-	-
5-	2	2	1	-	2	1	2
15-	5	4	3	3	4	5	5
45-	4	1	1	-	-	1	-
65-	1	1	1	1	-	2	-
All ages	12	8	6	4	6	9	7

There has thus been a slight decrease in the numbers of deaths, and the decrease appears to be among older persons; the numbers of deaths among young adults have not decreased. The number of dental operations performed has not changed materially, but more are being carried out in hospital.

	1962	1963	1964	1965	1966
	(in thousands)				
General anaesthetic:					
by operating dentist	188	174	164	159	155
by doctor or other dentist	771	775	766	752	751
Extractions					
courses of treatment involving extractions of permanent and deciduous teeth	2,798	2,798	2,848	2,763	2,769
courses of treatment involving removal of cysts, buried roots, impacted teeth etc.	60	64	65	68	75
Total number of teeth extracted	10,407	10,024	10,166	9,498	9,005

Partial information about the age of patients operated upon in NHS hospitals is available from the Hospital In-patient Enquiry (based on a ten per cent sample) for the year.

Age:	1961		1966	
	Males	Females	Males	Females
0-	610	510	590	480
5-	3,410	3,180	3,440	3,270
15-	8,880	12,750	12,450	16,780
45-	2,970	4,020	3,540	3,840
65-	740	810	790	1,060
Total	16,620	21,280	20,810	25,430
(both sexes)	37,900		46,240	

Many of the deaths are reported with multiple medication, so that allocation of responsibility for the death is difficult. The deaths can be classified as follows.

Table C50. Death with mention of anaesthetic for dental operation as contributing to death, England and Wales

		Nature of anaesthetic and medication				
		1961-1963	1964	1965	1966	1964-1966
General (inhalation) alone:						
	Nitrous oxide (alone*)	4	1	-	1	2
	Halothane	1	-	-	1	1
	Nitrous oxide + halothane	3	2	-	1	3
	Trichlorethylene	1	-	-	-	-
	Mixed inhalants	2	1	1	-	2
	unspecified	3	2	2	2	6
Total deaths		14	6	3	5	14
Intravenous alone		-	-	-	-	-
Inhalation and intravenous		1	-	-	-	-
Intravenous or inhalation with relaxant:						
	Methohexitone	1	-	-	-	-
	Thiopentone					
	Suxamethonium	3	-	-	1	1
	Scoline					
	Gallamine and					
	suxamethonium					
	Total deaths	5	-	-	1	1
Other mixed medication:						
	Phenergan, succinylcholine, methohexitone, nitrous oxide	-	-	1	-	1
	Others (atropine, omnopon, scopolamine, pethidine)	2	-	-	-	-
Total deaths		2	-	1	-	1
All deaths		21	6	4	6	16

* oxygen is disregarded

Place of death under dental anaesthesia

	1962	1963	1964	1965	1966	Deaths per thousand operations
In hospital	3	7	4	2	4	.0093
Elsewhere	1	4	2	2	2	.0044

Table C51 presents a few of the most commonly recorded adverse reactions analysed by the drugs mentioned and giving the number of times each reaction was mentioned. Shared responsibility (half and half) with combined drugs has been counted as one half scored against each drug and is shown in the table as (+). The largest score is on account of gastric erosions and gastro-intestinal haemorrhage associated with steroids, with eleven points; the next largest with only one point less was phenylbutazone, which scored ten points with aplastic anaemia. It needs to be remembered that these scores depend also upon the frequency with which the drugs are prescribed and the prevalence of the diseases which require their use, and also that many reactions by more potent drugs (such as anti-neoplastic agents) may not be reported when they are used for treatment of diseases more fatal than rheumatism. In addition, the full story may not be reported on the death certificate; the patient for whom phenylbutazone was prescribed may also have been taking aspirin, and gastric erosion produced by aspirin may be unjustly attributed to the other drug.

The classification used in the past has not been entirely satisfactory, and the system based on the American Hospital Formulary and adopted by ICD (from 1968 onwards) enables a more systematic presentation of drug poisoning to be made. It is being introduced for the adverse reaction in advance of 1968 so as to have earlier results available for comparison in the future.

Table C51. Fatal adverse effects of drugs, 1966, England and Wales

	Acute pulmonary oedema	Adrenal failure	Agranulocytosis, Leukopenia	Aplastic anaemia, Marrow depression	Gastro-intestinal haemorrhage and erosions	Haemorrhage into brain	Hepatic necrosis and jaundice	Perforation of bowel and peritonitis	Renal failure	Thrombocytopenia
Actinomycin			1							1
*Anaesthetic	3					2				
Anticoagulant					3				1	
Aspirin										1
Biligradin										1
Bendrofluazide										
Busulphan				1			1			
Blood transfusion										
Carbimazole			1							
Chloramphenicol			5							
Chlorpromazine			2			1	3			
Cytotoxic				3					+	
Cortisone										
Fluouracil				1						
Gold				1						
Halothane					2		2			
Jactofer				1						
Iproniazid							1			
Isoniazid							1			
Imipramine							1			
Melphalan									1	
Methotrexate				1			1			
Methyldopa										
Mustine			1							
Oxyphenbutazone					1		1			
Oestrogen			+						4+	
Phenacetin					1	2				
Phenindione					1+					
Phenylbutazone			4+	10	1					1
Prednisolone										
Prednisone					1+					
Promazine			1							
Phenelzine						1			4	
Radiotherapy			+	1						
Steroids		3			11			7		
Streptomycin				1						
Tetramine				1						
Thiotepa			1+	1						
Triethylene thiophosphoramide			1							
Tranlycypromine						1				

* Nitrogen dioxide instead of nitrous oxide

+ = shared (½, ½) responsibility

Table C52. Fatal therapeutic misadventures due to adverse reaction to drug or therapy, 1966, England and Wales

Drug or therapy	No. of cases	Nature of adverse reaction	Complicating condition if different from preceding column
Actinomycin	1	Agranulocytosis. Thrombocytopenia	Secondary hepatic nephroblastoma
Amitriptyline and chlorpromazine	1	Acute hepatic failure	Depression
Anaesthetics (14 cases)			
Contamination - nitrogen dioxide	1	Pulmonary oedema	Carcinoma cervix
with nitrous oxide	1	-	Operation for hernia
	1	Acute pulmonary oedema	Early biliary cirrhosis of liver due to gallstones. Anaesthetics for cholecy- stectomy
Ether	1	Cardiac arrest	Circumcision
Halothane	2	Acute liver necrosis Gastro-intestinal haemorrhage. Multiple acute erosions. Sustained liver toxicity. Necrosis of liver	Inguinal hernia
Lignocaine (20%) with adrenaline (1/100,000) 3 c.c. in all	1	Anaphylactic shock	-
Nitrous oxide, 25% oxygen, 20% halothane	1	Cardiac arrest	Dental extraction
Nitrous oxide, oxygen and halothane	1	Atelectasis and pneumothorax. Ruptured stomach	Lumbar meningo - myelocele
Pentothal*, oxygen, scoline	1	Respiratory failure	Caesarean section
Pentothal*, scoline, nitrous oxide, oxygen, halothane	1	Idiosyncrasy	Removal of tumour (malignant) and skin graft
Thiopentone, gallamine, nitrous oxide and oxygen	1	Ventricular fibrillation. Cerebral anoxia. Broncho- pneumonia	Duodenal ulcer
Xylocaine*	1	Aspiration of air from left sided pneumothorax. Cardiac and respiratory failure	Cor pulmonale. Chronic bronchitis and emphysema
Unspecified	1	Asphyxia. Inhalation of blood	Status epilepticus
Anticoagulant n.o.s. (5 cases)	1	Cardiac tamponade	Deep vein thrombosis. Operative repair of hiatus hernia
	1	Haemopericardium	Pulmonary embolism. Thrombo- phlebitis of femoral veins

Table C52 - (continued)

Drug or therapy	No. of cases	Nature of adverse reaction	Complicating condition if different from preceding column
Anticoagulant n.o.s. (5 cases) (continued)	1	Intracerebral haemorrhage	Coma
	1	Intracerebral haemorrhage	Hypertension. Iliac vein thrombosis
	1	Subcapsular haemorrhage of liver. Haemoperitoneum	Thrombophlebitis. II Acute purulent bronchitis
Aspirin (2 cases)	1	Acute gastric erosion. Haematemesis	Cerebral atherosclerosis
	1	Bronchopneumonia. Haemate- mesis. Peptic ulceration	-
Beechams powder	1	Acute gastric erosion. Gastro-intestinal haemorr- hage. Congestive heart failure	-
Bendrofluazide	1	Thrombocytopenic purpura. Multiple haemorrhages	Ischaemic heart disease
Biligrafin*	1	Bronchopneumonia. Renal failure	Gallstones
Busulphan	1	Aplastic anaemia	Polycythaemia rubra vera
Butazolidin* (11 cases)	1	Agranulocytosis. Fulmina- ting septicaemia. Hypo- plastic anaemia	Rheumatoid arthritis
	1	Aplastic anaemia	Carcinoma of stomach
	1	Aplastic anaemia	Rheumatism
	2	Aplastic anaemia	Rheumatoid arthritis
	1	Bronchopneumonia. Aplastic anaemia	-
	1	Bronchopneumonia. Aplastic anaemia	Chronic rheumatoid arthritis
	1	Bronchopneumonia. Intestinal haemorrhages	Phlebitis
	1	Cardiac failure. Aplastic anaemia	Osteoarthritis of spine
	1	Depression of bone marrow	Osteoarthritis
	1	Septicaemia. Cellulitis of leg. Leucopenia	Rheumatoid arthritis
Butazolidin* and aspirin	1	Gastric erosions. Haemate- mesis and melaena	Rheumatoid arthritis
Butazolidin* and phenacetin	1	Bronchopneumonia. Agranulo- cytosis	Arthritis
Carbimazole	1	Agranulocytosis	Thyroid condition
Chloramphenicol n.o.s. (4 cases)	1	Acute pneumonia. Septicae- mia. Aplastic anaemia	-
	1	Congestive heart failure. Aplastic anaemia	Chest troubles
	1	Intracranial haemorrhage. Aplastic anaemia	Respiratory infection
	1	Septicaemia. Aplastic anaemia	Acute pneumonia

Table C52 - (continued)

Drug or therapy	No. of cases	Nature of adverse reaction	Complicating condition if different from preceding column
Chloromycetin*	1	Thrombocytopenia. Cerebral haemorrhage. Aplastic anaemia	Impetigo
Chlorpromazine (3 cases)	1	Bronchopneumonia. Agranulocytosis	Ischaemic heart disease. Dementia
	1	Hepato-cellular jaundice. Bronchopneumonia	Senility
	1	Obstructive jaundice. Hepatic coma. Intrahepatic cholestasis	Chronic bronchitis and emphysema
Chlorpropamide	1	Hypoglycaemic coma	Diabetes mellitus
Corticosteroid n.o.s.	1	Acute pancreatitis	Rheumatoid arthritis
Cortisone (3 cases)	1	Intraperitoneal haemorrhage. Epistaxis	Rheumatoid arthritis
	1	Perforated ileum	Chronic rheumatic arthritis
	1	Purulent pancreatitis. Bronchopneumonia. Renal vein thrombosis	Rheumatoid arthritis
Cortisone and phenacetin	1	Analgesic nephritis. Uraemia. Renal failure	Arthritis
Cytotoxic (3 cases)	1	Aplastic anaemia	Carcinoma of bronchus
	1	Aplastic anaemia. Cerebral haemorrhage	Carcinomatosis
	1	Aplastic anaemia. Multiple internal haemorrhages	Malignant melanoma
Dialysis	1	Hypernatraemia	Renal disease. Malignant hypertension
Digitalis	1	Congestive heart failure. Atrial tachycardia	Coronary atherosclerosis
Dindevan* (3 cases)	1	II. Gastro-intestinal haemorrhages	I. Rheumatic heart disease. Pulmonary congestion. Mitral stenosis
	1	Haemorrhage	Phlebothrombosis
	1	Pulmonary haemorrhage	I. Pulmonary embolus. Obstructive jaundice. (Calculi) II. Cardiac renal failure. Chronic pyelonephritis.
Dihydrotachysterol or sodium laevothyroxine	1	Toxic effects	-
Electro convulsive	1	Respiratory and cardiac failure	-
Epanutin*	1	II. Severe macrocytic anaemia	I. Collapsed respiratory failure. (Idiopathic epilepsy)

Table C52 - (continued)

Drug or therapy	No. of cases	Nature of adverse reaction	Complicating condition if different from preceding column
Fluo-uracil therapy	1	II. Marrow toxemia	Carcinoma of caecum
Gold	1	Aplastic anaemia	Rheumatoid arthritis. II. Superinfection
Heparin	1	Staphylococcal septicaemia	Disobliteration of femoral artery
Insulin (3 cases)	1	Hypoglycaemia	Diabetes mellitus
	1	Pulmonary oedema. Status epilepticus. Hypoglycaemia	-
	1	(in absence of food) Hypoglycaemia	Sugar diabetes. II. Congestive heart failure. Chronic pyelonephritis
Iproniazid	1	Hepatic necrosis	Depressive psychosis
Isoniazid	1	Chronic hepatitis (toxic). Peritonitis with ascites	Pulmonary tuberculosis
Jectofer*	1	Aplastic anaemia	Prostatic hypertrophy. Hydro-nephrosis
Largactil* (2 cases)	1	Hepatitis. Acute renal failure	-
	1	Toxaemia. Agranulocytosis	Depression with agitation
Melphalan	1	Renal failure. Congestive cardiac failure worsened by Melphalan	Multiple myeloma
Methedrine*	1	Staphylococcal septicaemia	-
Methotrexate*	1	Aplasia of marrow. Bronchopneumonia	Malignant parotid tumour
Methyldopa	1	Toxic hepatitis. Hepatic failure	Hypertensive ischaemic heart disease
Nardil*	1	Paroxysm of hypertension. Intracerebral haemorrhage	-
Negram*	1	Exfoliative dermatitis and bronchitis	Urinary tract infection
Oestrogens	1	Hepatitis. Intrahepatic biliary stasis	-
Ovulen*	1	Phlebothrombosis	Pulmonary embolism
Penicillin (3 cases)	1	Anaphylactic shock	-
	1	Anaphylactic shock. Bronchopneumonia	Enteritis
	1	Anaphylactic shock. Peripheral circulatory failure	-

Table C52 - (continued)

Drug or therapy	No. of cases	Nature of adverse reaction	Complicating condition if different from preceding column
Pertofran*	1	Agranulocytosis. Broncho-pneumonia	-
Phenacetin (5 cases)	1	Chronic renal failure. Papil- lous necroticans	II. Anaemia
	1	Methaemoglobin. Acute haemo- lytic anaemia	-
	1	Renal failure	-
	1	Renal necrosis	II. Cardiac failure. Hyper- tension
	1	Uraemia. Renal papillary necrosis	II. Rheumatoid arthritis
Phenindione (2 cases)	1	Cerebral haemorrhage	Hypertension
	1	Cerebral haemorrhage	Pulmonary embolism
Phenylbutazone (6 cases)	1	Agranulocytosis	Rheumatoid arthritis
	1	Agranulocytosis. Pneumo- coccal septicaemia	Rheumatoid arthritis
	1	Aplastic anaemia	-
	1	Aplastic anaemia	Osteoarthritis
	1	Aplastic anaemia. Broncho- pneumonia	I. Rheumatoid arthritis. II. Aortic stenosis
	1	Thrombocytopenic purpura. Multiple haemorrhages	Osteoarthritis
Phenytoin sodium	1	L. Ventricular failure. Macrocytic anaemia	Epilepsy. Convulsions. II. Silicosis
Prednisolone	1	Haematemesis and melaena. Gastric ulcer	Rheumatoid arthritis
Prednisone	1	Haematemesis. Peptic ulcer	Cerebral arteritis
Prednisolone and Butazolidin*	1	Haematemesis and melaena	Rheumatoid arthritis
Promazine	1	Lobar pneumonia. Agranulo- cytosis	Mental confusion
Radiation (30 cases) Super Voltage therapy	1	Chronic sinus	Transitional tumour of bladder. Staphylococcal enteritis
Deep X Rays (3 cases)	1	Fibrosis	I. Arteriosclerosis. Myocardial degeneration. II. Carcinoma of lung. Emphysema
	1	Laryngeal obstruction	Cancer of larynx. Broncho- pneumonia.
	1	Necrosis	Carcinoma of bronchus. Haemoptysis
Radiotherapy (10 cases)	1	Chronic cystitis	Carcinoma of bladder
	1	Fibrosis	Cardiac failure. Haemorrhage. Carcinoma of breast. Rup- tured subclavian vein

Table C52 - (continued)

Drug or therapy	No. of cases	Nature of adverse reaction	Complicating condition if different from preceding column
Radiation (30 cases) (continued)			
Radiotherapy (10 cases) (continued)	1	Internal haemorrhage.	Carcinoma of thyroid and bony metastases
	1	Aplastic anaemia	Carcinoma of breast
	1	Liver failure. Infective hepatitis	Carcinoma of breast with secon- daries. Congestive cardiac failure
	1	Pulmonary fibrosis	Hodgkin's disease
	1	Peritonitis. Intestinal obstruction. Adhesions	Carcinoma of bladder
	1	Pelvic sepsis	Carcinoma of bladder
	1	Nephrotic syndrome. Renal failure. II. Fistula (bowel to skin)	
	1	Renal failure	Carcinoma of cervix
	1	Renal failure. Ureteral obstruction. Fibrosis.	Carcinoma of cervix
Radium	1	Necrosis chest wall. Chronic osteomyelitis of ribs	Carcinoma of R. breast
Not specified (15 cases)	1	Burn of chest. Toxaemia	Carcinoma of breast
	1	Fibrosis	Carcinoma of breast. Senile arteriosclerosis. Bilateral bronchopneumonia
	1	Fibrosis of left lung. Emphysema right lung. Respiratory failure	-
	1	Fibrosis of right lung and chest wall	Carcinoma of right breast. Bronchopneumonia. Auricular fibrillation. Acute pulmon- ary oedema
	1	Ileitis. Perforated gastric ulcer	Carcinoma of cervix. Malignant cachexia
	1	Necrosis. Perforation of des- cending colon. Peritonitis	Carcinoma of bladder
	1	Necrosis of spinal cord. Paraplegia and respiratory failure	Papilloma of vocal cord
	1	Nephritis. Renal failure. Uraemia	Lymphosarcoma
	1	Nephritis. Renal failure. Uraemia	Hodgkin's disease
	1	Pneumonitis	Chronic bronchiectasis
	1	Pulmonary fibrosis	Carcinoma of breast
	1	Pyopneumothorax	Carcinoma of breast
	1	Reticulum cell leukaemia	Ankylosing spondylitis
	1	Rupture of oesophagus	Malignant synovioma. Cardiac failure
	1	Vesicular haemorrhage. Cystitis	Carcinoma of bladder
Irradiation and thiotepa	1	Agranulocytosis	Carcinoma of breast with pleural effusion

Table C52 - (continued)

Drug or therapy	No. of cases	Nature of adverse reaction	Complicating condition if different from preceding column
Saline emetic	1	Hypernatraemic encephalopathy	Coma due to barbiturate intoxication (Sodium Amytal*)
Steroids (28 cases)	1	Acute adrenal failure	Chronic rheumatoid arthritis. II. Acute respiratory tract infection
	1	Acute gastric ulcer	Ulcerative colitis. Total colectomy
	1	Acute gastric ulceration	II. Asthma and pulmonary emphysema
	1	Acute gastric ulcers. Gastric haemorrhage	II. Lymphosarcoma
	1	Acute peptic ulcer. Haematemesis	Asthma. Diverticulitis. Benign prostatic hypertrophy
	1	Acute peptic ulceration of duodenum. Gastro-intestinal haemorrhage	Rheumatoid disease of lungs. Pneumoconiosis
	1	Acute suprarenal failure. Upper respiratory tract infection	Chronic polymyositis
	1	Adrenal failure	II. Rheumatoid arthritis
	1	Cachexia	Pemphigoid
	1	Cerebral haemorrhage	Rheumatoid arthritis
	1	Clostridium Welchii infection. Aplastic anaemia	Spontaneous fracture of femur
	1	Gastric haemorrhage	II. Pemphigus
	1	Gastro-intestinal bleeding. Haematemesis and melaena	-
	1	Gastro-intestinal bleeding	Rheumatoid arthritis. II. Previous peritonitis. Intestinal obstruction
	1	Gastro-intestinal haemorrhage. Perforation	-
	1	Multiple perforations of small gut. Bronchopneumonia	Rheumatoid arthritis
	1	Peptic ulcer. Haematemesis and melaena	Rheumatoid arthritis
	1	Perforated duodenal ulcers	Disseminated lupus erythematosus
	1	Perforated gastric ulcer. Pulmonary embolism. Phlebothrombosis	Rheumatoid arthritis
	1	Perforation of large intestine	Rheumatoid arthritis
	1	Perforation of stomach	-
	1	Peritonitis	Rheumatoid arthritis
	1	Septicaemia. Acute respiratory failure	Pemphigoid
	1	Septicaemia. Pyogenic meningitis. H. Influenzae	Thrombocytopenia
	1	'Steroid therapy' (sic)	Hypostatic bronchopneumonia, anaemia. II. Arthritis
	1	Subarachnoid haemorrhage. Renal cortical necrosis. Hypotension. Acute infection	Vaso motor rhinitis
	1	Superior mesenteric artery thrombosis. Bronchopneumonia. Pancreatitis. Peritonitis	II. Rheumatoid arthritis
	1	Uraemia. Erysipelas	Temporal arteritis. II. Senility

Table C52 - (continued)

Drug or Therapy	No. of cases	Nature of adverse reaction	Complicating condition if different from preceding column
Streptomycin	1	Aplastic anaemia	Pulmonary tuberculosis
Tanderil*	1	Acute gastric erosion. Gastric haemorrhage	Coronary thrombosis due to atheroma. Arthritis
Tetracycline	1	Staphylococcal enteritis	Hodgkin's disease (lympho-epithelioma)
Thiotepa (2 cases)	1	Agranulocytosis	Carcinoma, recto-sigmoid colon
	1	Aplastic anaemia	Primary carcinoma, ovary
Tofranil*	1	Acute atrophy of liver	Post-natal depression
Tranlycypromine	1	Cerebral haemorrhage	Anxiety
Tretamine	1	Acute marrow aplasia	Carcinoma, bronchus
Tridione* and Mandrax	1	Acute yellow atrophy of liver	Epilepsy
Triethylene thiophosphoramide	1	Aplastic anaemia	Lymphosarcoma, post-abdominal wall
Trifluoperazine	1	Pulmonary embolism. Phlebothrombosis	-
Trillekamin*	1	Granulocytopenia. Bronchopneumonia	Malignant reticulo-sarcoma
Transfusion (blood)	1	Homologous serum jaundice. Acute hepatic necrosis	Amoebic dysentery
	1	Drug induced jaundice	Chronic duodenal ulcer. Infective thrombophlebitis of arm. Bronchopneumonia
OTHER DRUGS AND THERAPY	1	Hepatic necrosis. Drug toxicity	II. Hypothermia
	1	Bronchopneumonia. Cellulitis of leg. Venous thrombosis. Infection	-
Drug unknown (2 cases)	1	Drug induced jaundice	Chronic duodenal ulcer. Infective thrombophlebitis of arm. Bronchopneumonia
Anti rheumatic paste	1	Bronchopneumonia. Cellulitis of leg. Venous thrombosis. Infection	-
Total	183		

* Proprietary name mentioned.

Table C53. Fatal therapeutic misadventures due to overdose of drug, 1966, England and Wales

Drug or combination of drugs	Cases			Drug or combination of drugs	Cases		
	Medically administered	Self-administered	Administration not stated		Medically administered	Self-administered	Administration not stated
Alupent*		1		Marzine		1	
Amylobarbitone		2	6	Medinal*			3
Amylobarbitone and quinalbarbitone		1	1	Nembutal*		4	7
Amylobarbitone and alcohol		2		Nortryptylone and Librium*			1
Amylomet (sic) 'barbiturate'		1					
Amytal*		4	4	Oblivon*		1	
Amytal* and alcohol		1					
Anti-depressive (unspecified)		1		Paraldehyde			1
Aspirin		3	5	Pentobarbitone		1	
				Pentobarbitone and carbromal			1
Barbitone			1	Phenobarbitone		2	3
Barbitone sodium		1		Phenobarbitone and alcohol		1	
Barbiturate		2	26	Phenobarbitone, amylobarbitone and quinalbarbitone			1
Barbiturate and alcohol		3					2
Bromide and chloral			1	Quinalbarbitone			
				Quinalbarbitone and amylobarbitone		3	
Carbrital*		3	3	Quinalbarbitone, amylobarbitone and phenobarbitone		1	
Carbrital* and alcohol		1					
Codeine and aspirin			1	Seconal*		1	2
Codeine and chloral			1	Seconal* and alcohol		1	
				Seconal Sodium*			1
'Depressant' (unspecified)			1	Sleeping tablets (unspecified)		2	1
Diabinese*			1	Sodium Amytal*		13	11
Digitalis	1			Sodium Amytal* and alcohol		3	
Disipal*			1	Sonergan*		1	1
Doloxene*			1	Soneryl*		4	8
Doloxene* and Epanutin*			1	Soneryl* and alcohol		2	
Doriden* and alcohol		1		Soneryl* and carbital			1
				Soneryl* and Nembutal*			1
Ephedrine			1				
Epanutin*			1	Tanderil*		1	
				Tofranil* and Tuinal*		1	
Imipramine and sodium amylobarbitone			1	Tryptizol*			1
Insidon*		1		Tuinal*		21	12
Insulin			1	Tuinal* and alcohol		3	
Insulin and alcohol		1		Tuinal* and chloroquine			1
				Tuinal* and paraldehyde		1	
Largactil*		2	1				
Largactil* and alcohol		1		Welldorm*			1
Largactil*, Serenace*, Disipal* and Sodium Amytal*			1				
				Total	1	100	120

* Proprietary name mentioned.

Table C54. Fatal therapeutic misadventure due to mistake in drug administration, 1966, England and Wales

Therapeutic misadventure associated with	Nature of misadventure
Succinylcholine	Intramuscular injection of ampicillin mixed with succinylcholine instead of sterile water

Table C55. Fatal therapeutic misadventure due to accident in technique, 1966, England and Wales

GRO Code No.	Operation or surgical procedure	Nature of misadventure	Notes
001-049	Neurosurgery		
003	Ventriculography - 1 case	Cerebral haemorrhage	I. Parkinson's disease
200-249	Ear, nose and throat surgery		
245	Tracheotomy - 1 case	Air embolism	Laryngeal obstruction, acute laryngotracheitis
246	Tracheostomy - 2 cases	Asphyxia from accidental failure of tube	Respiratory paralysis, acute ascending polyneuritis. II. Following but not clearly as a result of compound fractures of both legs sustained in accident in mine
		Cerebral anoxia associated with stenosis of tracheostomy	Meningitis and fractured skull, fall from window
250-299	Buccal cavity and oesophageal surgery		
251	Extraction of molar tooth - 1 case	Asphyxia due to obstruction of bronchi due to inhalation of tooth	-
261	Tonsillectomy with adenoidectomy - 1 case	Myocardial failure due to haemorrhage	-
287	Oesophagoscopy - 2 cases	I(a) Bronchopneumonia. (b) Perforated oesophagus	Carcinoma of oesophagus
		Rupture of oesophagus	I(a) Pulmonary embolism. (b) Repair of ruptured oesophagus. II. Fragile condition of oesophagus
288	Oesophagoscopy and dilatation - 2 cases Dilatation of oesophagus (by bougie)	I(a) Generalised peritonitis. (b) Perforation of lower oesophagus	Oesophageal stenosis
	Oesophagoscopy and dilatation	Pyopneumothorax following rupture of the distal oesophagus	Oesophagitis resulting from spasm of cardia
289	Other operations on oesophagus ('operative treatment') - 1 case	II. Hydropneumothorax due to rupture of oesophagus	I(a) Congestive heart failure. (b) Coronary artery disease

Table C55-(continued)

GRO Code No.	Operation or surgical procedure	Nature of misadventure	Notes
300-379	Thoracic surgery		
304	Operations on valves of heart - 7 cases	Cerebral infarction due to air embolization	Rheumatic aortic stenosis
		Uncontrollable haemorrhage. Left ventricular tear at operation	Mitral incompetence
	Aortic valve replacement	Cerebral anoxia. Heart machine broke down	-
		I(a) Cardiac failure. (b) Myocardial ischaemia. (c) Coronary laceration	II. Calcific aortic stenosis. Anaesthetic-thiopentone, nitrous oxide and oxygen
		I(a) Hypotension. (b) Haemorrhage following rupture of myocardium	-
	Aortic and mitral valve replacement	Cerebral air embolism	-
	Insertion of Starr prosthesis	Internal bleeding following stripping of adhesions	-
305	Repair of congenital defect of heart - 3 cases	Bronchopneumonia; coma; anoxia. Heart and lung machine failed	-
		Cerebral air embolism	Fallot's tetralogy
	Total correction	I(a) Massive haemorrhage. (b) Wound infection	Fallot's tetralogy
319	Other operations on heart and pericardium - 3 cases		
	Cardiac catheterisation	I(a) Haemopericardium due to (b) rupture of right ventricle due to penetration by cardiac catheter	Rheumatic carditis
		I(a) Right haemothorax and mediastinal haemorrhage. (b) Rupture of internal mammary artery	Aortic rheumatic valvulitis
	Insertion of pace maker	Staphylococcal septicaemia	Stoke-Adams syndrome
320	Operation on aneurysm of aorta - 1 case	Needle punctured aorta during operation. Haemothorax	Aneurysm of aorta
331	Thoracotomy for recovery of broken intravenous catheter - 1 case	Acute septicaemia with bronchopneumonia. Mediastinitis and pericarditis	-
332	Thoracentesis (local anaesthetic) - 1 case	Air embolism	Empyema
338	Bronchoscopy and biopsy - 1 case	Haemorrhage due to tear of bronchial artery by biopsy forceps	Suspected tumour of bronchus

Table C55-(continued)

GRO Code No.	Operation or surgical procedure	Nature of misadventure	Notes
300-379	Thoracic surgery (continued)		
339	Other operations on bronchi - 2 cases		
	Removal of carcinoma of bronchus	Tear of right pulmonary vein and left atrium	(Weakened by infiltration of carcinoma)
		Ruptured right atrium	Carcinoma, right main bronchus, invading right atrium
344	Pneumonectomy - 3 cases (Right)	Haemorrhage from slipping of ligature on pulmonary artery	-
		Hypotension. Rupture of pulmonary vein	Carcinoma, lung
	Operation for chronic pulmonary tuberculosis	I(a) Haemoptysis. (b) Ulceration of tuberculous granulation tissue in a sinus caused by a retained tube	-
400-599	Gastro-intestinal and abdominal surgery		
400	Laparotomy - 1 case	Perforation of ileum	Probably surgical trauma to intestine damaged by tuberculous peritonitis
404	Hernioplasty, other and unspecified - 3 cases		
	Operation for obturator hernia	Intestines burst out	I(a) Circulatory failure (peripheral). (b) Partial obstruction of small gut
	Operation for exomphalos	I(a) Meningitis. (b) Post operative wound sepsis	-
	Operation for hiatus hernia	Perforated oesophagus	Pyloric ulcer
413	Peritoneoscopy - 1 case	I(a) Acute cardiac failure. (b) Air embolism	II. Steatorrhoea and duodenal stricture
420	Gastrotomy, insertion of Porges tube - 1 case	I(a) Peritonitis. (b) Perforation of stomach	II. Carcinomatosis of stomach, oesophagus and liver
423	Gastrectomy, partial - 3 cases	I(a) Peritonitis. (b) Faecal fistula. Accidental bowel perforation. Abdominal abscess	Secondary carcinoma of stomach
		Intra-abdominal haemorrhage due to ruptured spleen at operation	Duodenal ulcer
	(Polya type)	Staphylococcal pneumonia spread from wound infection	-
424	Gastrostomy - 1 case	Peritonitis; operative shock; gastrostomy tube slipped out of the stomach and into the abdomen	Tracheo-oesophageal fistula

Table C55-(continued)

GRO Code No.	Operation or surgical procedure	Nature of misadventure	Notes
400-599	Gastro-intestinal and abdominal surgery (continued)		
441	Appendicectomy - 1 case	I(a) Paralytic ileus. (b) General peritonitis. (c) Perforation of small intestine. II. Adhesions causing intestinal obstruction following acute appendicectomy	-
479	Other operations on rectum Barium enema - 1 case	Rupture of rectum	Investigation of carcinoma of sigmoid colon. Secondary carcinomatous deposits in liver
501	Hepatectomy - 1 case	I(a) Haemorrhage. (b) Tear of the inferior vena cava	Malignant hepatoblastoma
519	Other operations on bile passages (Operation for chronic biliary obstruction) - 1 case	Accidental cutting of duct during operation	I(a) Hepatic failure. II. Diabetes
521	Cholecystectomy - 2 cases	Acute peritonitis due to leakage of bile from bed of gall bladder. Laceration of exposed branch bile duct Biliary peritonitis; severed bile ducts	Non-functioning gall bladder Cholelithiasis
600-699	Genito-urinary surgery		
600	Nephrotomy - 1 case	Slipped ligature. Haemorrhage	Hypernephroma of kidney
606	Nephrectomy - 1 case	Haemorrhage from inferior vena cava	Carcinoma of right kidney
649	Cystoscopy - 1 case	I(a) Renal failure. (b) Bacteraemic shock	Intestinal obstruction, volvulus of caecum
659	Other operations on bladder (cystography) - 1 case	Cardiac inhibition due to rupture of bladder	-
675	Prostatectomy, transurethral - 1 case	Shock and haemorrhage due to perforation of urinary bladder	Ischaemic heart disease
700-759	Gynaecological operations		
722	Hysterectomy - 1 case	I(a) Septicaemia. Peritoneal cavity infection from staphylococcus aureus	Uterine fibroids
727	Excision of uterus - 1 case	I(a) Massive acute pulmonary embolism. (b) Pelvic thrombophlebitis. (c) Clostridium Welchii wound infection (gas gangrene)	Fibroids

Table C55-(continued)

GRO Code No.	Operation or surgical procedure	Nature of misadventure	Notes
760-799	Obstetric operations		
789	Removal of retained infected products of conception - 1 case	Toxaemia from acute peritonitis following perforation of the uterine wall	-
790	Intra-amniotic injection - 1 case	Cerebral necrosis due to leakage of hypertonic saline into the bloodstream	Termination of pregnancy
800-899	Orthopaedic surgery		
805	Operation for fractured neck of femur - 1 case	I(a) Pyelonephritis. (b) Infected wound	II. Fractured neck of femur
828	Operation for intravertebral cartilage - 1 case	Air embolism	Prolapsed intravertebral disc
900-929	Surgery on peripheral blood vessels and lymphatic system		
903	Operation on cerebral aneurysm - 1 case	Failure of hypothermic apparatus	I(a) Myocardial infarction. (b) Coronary thrombosis following necrosis of liver subsequent to 2nd and 3rd degree burns of body
913	Phlebectomy - 1 case	I(a) Pseudo-membranous enterocolitis due to (b) staphylococcal infection	Varicose vein
950-999	Other surgical procedures		
951	Transfusion of blood - 4 cases	Cardiac failure due to air embolism II. Incompatible blood	Haemolytic disease of newborn Cardiac arrest due to haemoperitoneum due to traumatic rupture of spleen; struck by component of an agricultural machine
	Operation and blood transfusion	Incompatible blood	I(a) Shock. (b) Acute peritonitis. (c) Gangrene with perforation of distal ileum
	Prostatectomy and blood transfusion	I(a) Cholaemia. (b) Serum hepatitis	Simple enlargement of prostate
954	Injection, intravenous - 1 case	I(a) Hepatic renal failure. (b) Klebsiella septicaemia	-
958	Haemodialysis - 1 case	Haemorrhage	After stone removal from only kidney
987	Catheterisation, bladder - 1 case	I(a) Peritonitis. (b) Perforation	-
999	Tube feeding - 2 cases	Rupture of oesophagus I(a) Peritonitis. (b) Perforation of stomach	I(a) Pneumonia. II. Premature baby Premature infant
Total - 71 cases			

Table C56. Therapeutic misadventures - Summary, 1961 to 1966, England and Wales

Fatal misadventure due to:	Number of deaths					
	1961	1962	1963	1964	1965	1966
Adverse reaction to drug or therapy	188	220	181	103	235	183
Mistake in drug administration	2	-	1	1	1	1
Overdose of drug	117	157	166	176	215	221
Accident in technique	110	96	95	74	98	71

Table C57. Therapeutic misadventures, summary of adverse reactions to drug or therapy, 1957 to 1966, England and Wales

Drug or therapy	1957* and 1958	1959	1960	1961	1962	1963	1964	1965	1966
Anaesthetic agents	10	4	-	4	1	1	2	9	14
Analgesics	8	1	3½	4	15½	5	4	8½	9
Antibiotics n.e.c.	36	12½	13	22½	19½	16½	7½	12½	10
Anti-cancer-leukaemia	7	3½	12	9½	18	16	4	15½	13½
Anticoagulant	9½	13	10	20	21	16	10½	18	11
Anti-convulsant	4	2	2	1	2	2	-	2	2½
Anti-rheumatic	6	4	8	5½	14	12	8	20½	21½
Anti-tuberculosis	3	2½	½	1½	1½	-	1	-	1
Barbiturate and other hypnotics	3½	1	-	6½	3½	-	-	½	-
Corticosteroids and related drugs	11½	13	16½	28	40	25	18½	50½	35
Contrast media	3	2	1	3	3	-	-	3	1
Diuretics	4	1	3	2½	-	2	-	-	1
Endocrine, hormones, nutritional and metabolic agents	23	13	7	6½	8	3	-	7	8
Hypotensives	4½	1	½	-	1	-	-	-	1
Metals and compounds	9	2	2	3½	1	½	1	1	-
Psychiatric, tranquilisers	18	9	8½	5½	10	18	5	11½	13
Radiation (radio-active substances and x-rays)	42½	32	43	46	41	47	32	45½	30½
Sulphonamides	10½	2	3	3	2½	3	1½	½	-
Transfusions	21	6½	7½	6	8	3	3	10	1
Mixed responsibility	3	-	-	2	-	-	-	1	-
Drug n.e.c.	7	3	-	3½	4½	1	2	8½	6
Drug unknown	5	-	5	1	2	1	3	4	2
Electro-convulsive therapy	11	8	1	3	3	6	-	3	1
Other procedures	5	-	-	-	-	3	-	3	1
Total	265	136	147	188	220	181	103	235	183

Note. If two drugs or other forms of therapeutic misadventure are reported as being jointly responsible for the immediate causation of death, each is counted as one half in assessing comparative results.

* Combined total for two years.

UNITED KINGDOM

Vital Statistics

The vital statistics of the United Kingdom were last commented upon in the Registrar General's Statistical Review for 1962. For convenience the figures given have been brought up to date as follows:-

Table C58. Vital Statistics : 1938 and 1946 to 1966, United Kingdom

	Year	United Kingdom	England	Wales	Scotland	Northern Ireland		
Estimated mid-year home population (in thousands)	1966	P	54,654	45,281*	2,704*	5,191	1,478	
		M	26,505	21,979*	1,316*	2,490	720	
		F	28,149	23,302*	1,388*	2,701	758	
Marriages	1966	}	437,083	363,838	20,659	41,851	10,735	
			Live births(1)	979,587	804,957	44,866	96,536	33,228
			Deaths	643,754	528,981	34,643	63,689	16,441
Deaths of infants under 1 year of age			19,235	15,236	911	2,239	849	
Persons marrying, rates per 1,000 living	1938	17.2	17.6	16.2	15.5	13.4		
	1946-50	17.5	17.7	17.4	16.9	13.9		
	1951-55	15.9	15.9	15.7	16.3	13.5		
	1956-60	15.3	15.3	15.0	16.2	13.5		
	1961-65	15.1	15.1	14.8	15.5	14.1		
	1966	16.0	16.1	15.3	16.1	14.5		
Live births, rates(2) per 1,000 living	1938	15.5	15.1	15.3	17.7	20.0		
	1946-50	18.3	18.0	17.9	19.8	22.0		
	1951-55	15.7	15.3	15.7	17.9	20.8		
	1956-60	16.8	16.4	16.2	19.2	21.7		
	1961-65	18.3	18.1	17.4	19.7	23.0		
	1966	17.9	17.8	16.6	18.6	22.5		
Death rates(4) per 1,000 living	1931-38(3)	12.2	12.0	12.9	13.2	14.4		
	1946-50	11.6	11.4	12.6	12.3	11.8		
	1951-55	11.7	11.3	12.7	12.1	11.3		
	1956-60	11.6	11.5	12.4	12.0	10.8		
	1961-65	11.8	11.7	12.6	12.2	10.8		
	1966	11.8	11.7	12.8	12.3	11.1		
Infant mortality rates(5) (under 1 year) per 1,000 live births	1938	56	53	57	70	75		
	1946-50	38	36	42	47	48		
	1951-55	28	27	33	33	37		
	1956-60	23	22	27	28	28		
	1961-65	21	21	24	25	26		
	1966	20	19	20	23	26		

* Revised in the light of the 1966 Sample Census.

- (1) England and Wales: occurrences. Remainder: registrations.
- (2) The marriage and birth rates for 1938 and from 1951 are based on home population, but the 1946-50 aggregates are based on total population.
- (3) Here the 1931-38 aggregate is given, since crude death rates in the year 1938 were rather lower than in adjacent years.
- (4) The death rates are based on total deaths and home populations, except that the 1946-49 element in the 1946-50 aggregate is based on civilian deaths and civilian populations.
- (5) England and Wales: for 1957 onwards based on deaths per thousand live birth occurrences; for earlier years based on deaths per thousand related live births. Remainder: based on deaths per thousand births registered.

Appendix A

Articles and papers by Officers of General Register Office published during 1966

- Boreham, A. J. . . The pressure of population. *New Society Journal*, March, no. 179. pp. 9-12.
- Boreham, A. J. . . What the census does. *New Society Journal*, April, no. 186. pp. 9-10.
- Spicer, C. C. . . Inter-relation of methods of assessment. Statistical problems and technique. *Clinical evaluation of breast cancer*. pp. 231-239.
- Spicer, C. C. . . Some empirical studies in epidemiology. (Proceedings of the *Fifth Berkeley Symposium on Mathematical Statistics and Probability*, July 1965). pp. 207-215.
- Wilson, W. A. . . Communication on mortality trends by occupation and social class. (Submitted at Council of Europe; *European Population Conference*, Strasbourg, August). pp. 1-14.
- General Register Office . . Revised projections of the regional distribution of the United Kingdom population in 1971 and 1981. *Economic Trends*, (Central Statistical Office). no. 157, November. pp. ii-xvi.

Index to Statistical Reviews, part III (Commentary Volumes), 1952 to 1966

Note: The index contains references to the principal subjects of comment and to the major tabulations. Reviews are not referred to here since they are almost entirely regular annual tabulations and

	1952	1953	1954	1955
ABORTION, DEATHS				102
ACCIDENTAL DEATHS (see also AIRCRAFT, MOTOR, RAILWAY, WATER)	5,188	4,198	4,165	4,161
burns (see also home)		203		
coding			170	
drowning				
electricity				
exposure to cold				
fall	193	206		188
fall of window cleaners				
firearms, explosives				
gassing				
home			167	175
injuries				
lightning				
places of recreation and sport			170	
seasonal variation			170	
trend	198	209		161
working places				
ACCIDENTAL MECHANICAL SUFFOCATION			168	
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ACCIDENTAL POISONING	192	200	166	170
ACCIDENT - MOTOR AND OTHER ROAD VEHICLES	189	199	166	162
prevention in childhood (WHO)				
ACREAGES				
ADDITIONAL INFORMATION (Medical enquiries)				
ADOPTION	246			235
ADRENAL FAILURE				
ADVERSE REACTION TO DRUGS	212			
AGE DISTRIBUTION, POPULATION	9,11	7	6,8	6,11
AGE-SPECIFIC DEATH RATES				
AGE, STANDARDISATION FOR FERTILITY	13	13	10	
AGES OF MAN, MORTALITY OF				
AGRANULOCYTOSIS				
AIRCRAFT ACCIDENTS	192	200	166	169
AIR REGISTER BOOK (BIRTHS AND DEATHS)				
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ANTI-CANCER DRUGS, ADVERSE REACTION (see THERAPEUTIC MISADVENTURE)				
AORTIC ANEURYSM	138			

contained in the Commentary Volumes for the years 1952-1966. Tabulations in Parts I and II of the are therefore not difficult to find.

1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
3,156	2,162	101 67	107	130 93	136	106 230	112 167,196 167		185 204	63
181	178	158	161	180	186	158 240 239	197 167,198			
170	172	154	156	175	181	152	155 198 202 195 156		205	64
156	162	147	149	168	174	145 153	149 155	155	204	
158 266	164	67 148	150	170	103,175	241 241 235	189 191-195 190,191 167 150		112	63
270	217	185 203	234	230 250	313		215 214	189	247	
4,230		172	192	213	274	261,280	214	11	224,242	110
7	7	5	7	9	9				13 160	
		172		67			215		105	
				253		233				
217	192	171	190	88 211	272	253	210 215	181	127	51 107

	1952	1953	1954	1955
APLASTIC ANAEMIA (see also ADVERSE EFFECTS)				
AREA COMPARABILITY FACTORS (ACF)	64	54	30,57	41,63
ARTERIOSCLEROTIC HEART DISEASE, INCLUDING CORONARY DISEASE				
ARTICLES BY OFFICERS OF THE GENERAL REGISTER OFFICE	256	250	227	274
ASSOCIATED CAUSES OF DEATH, CHILDBEARING				
ASTHMA				
ATMOSPHERIC POLLUTION	4			
BIRTHS	2,12	2,12	2,9	2,14
age and parity			79	214
air register book				
annual fluctuations				
estimated childbearing period				
fertility trends				
illegitimate			32	42
legitimate				
age at marriage				
age of mother	23			
and fertility (see also FERTILITY)	21	20	17	21
duration of marriage	24			
intervals, marriage to last birth				
period of parenthood				
live	38			9,32
age, duration and parity	16	16	13	18
age, standardisation	13	13	10	
Area Comparability Factor			30	41
migration, effect of				
multiple	35	30	28	39
age of mother, legitimacy				
illegitimate				
mono-zygotic and dizygotic twins				
order (see also FAMILY SIZE)				
parity distribution of legitimate multiple births				
period of gestation				
place of confinement				214
pre-marital conception	18	18	15	19
stillbirth rates in twins				
rates				
geographical	36	31	29	40
geographical, fertility				
illegitimate	38	33	32	42
per 1,000 women aged 15-44	12	12	9	14
United Kingdom	236	229	208	221
seasonal	32	27	26	35
sex ratio	34	29	27	38
tabulation basis	16	16		
trend, increase since 1955				

1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
		172					215			
66	56								144	
187		65	70	90	102	72	165		153	52
294	299	222	258	281					248	
(see 1958)		109	111	93,132	138	108	114		185	
									127	51
2,11	1,9	27	41	5,41	4,57	33	64	51	46	
246	197	188	211	233	292	282	237			
				253						
									47	
									52	
									49	20
11					59	54	64	68	71	33
						52		63		
						50		55		
						55				
17	14	33	46	46	63	54		57	59	21
									50	
									56	
									47	
						63				
33	29	48	58	60	86					36
33					88					36
					93					
38					90					
24	20	40	54	57	76					45
244	197	187	210	232	291	67				
15	13	31	43	43	59	281	236			
						67				
										40
43	29	48	65	63	100	64				
288		216	254			310				
15,290	31	218	256							
11	9	27								
255	203	194	222	238	303	289	242	209	243	
28	24	43	59	60	96	45	77	53		
32	27	46	57	60	86	45,52	78	10,58		
14	12	30	42	42	58					
						33,48	64	51		

	1952	1953	1954	1955
BITES, VENOMOUS ANIMALS				
BRONCHITIS		174		
BRUSSELS TREATY ORGANISATION			218	
BUILDINGS IN WHICH MARRIAGES MAY BE SOLEMNIZED	52			
BURNS (see ACCIDENTAL DEATHS)				
CANCER	5,147	4,138	4,129	124,195
bladder	154,180			
bone	160,182			
brain	160,184			
breast	152,179			125,149
cervix uteri				149
children				
corpus uteri				
density of population and urbanisation		138,146		
digestive tract	156		145	
female genital organs (see also UTERUS)	152,178	145		125
gallbladder	160			
geographical		138	132,146	149
histological type	164	158	152	124
intestines	156,173			
kidney	158,180			
larynx	158,176		145	142,149
lip	157,170			
liver	158,174			
lung, bronchus (including pleura)	149,177		133,145	134,149
geographical, urbanisation		139		145
trends				
lymphatic and haematopoietic malignancy				
male genital organs	154			
marital status				
mouth, tonsil and upper respiratory passages	157			
oesophagus	156,172			
ovary	154,178			
pancreas	160,175			
pharynx	158,171			
pleura (see lung)				
prostate				
rectum				
regional variations (see geographical)	157,174			
registration				
and statistical presentation (WHO sub-committee)			202	
conference				233
respiratory tract				
sex ratio		147		
skin	158			
Standardised Mortality Ratios				149
stomach	156		135	
testis				
thyroid glands	160			

1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
212			201							
189		66,145	147	166,191	172	143	147,163	153	154,157	
	44					22				
3,126	110,127	63		87	102	72	79	82	102	50
	140	138	140	159	165	135	140	146	152	
	140	134	136	156	162	132	136	142		
		133	135	155	161	131	135	141		
	115	137	139	159,200	165	135	139	145	151	50
		137	139	159	165,210	135	139	145	152	
		137	139	159	165,210	135	139	145	152	
		131	133	153	159	129	133	139		
	140	135,136	137,138	157	163	133	137	143		
	115	137	139	159	165,210	135	139	145	152	
		131	133	153	159	129	133	139		
	140	131	133	153	159	129	133	139		
	110	126	128	148	154	124	128	134		
	114	136	138	157	163	133	137	143		50
	140	133	135	155	161	131	135	141		
	140								151	
	114	135	137	156	162	132	136	142	150	
	114									
186	124	137	139	158	164	134,164	138	144		
	138,140	131	133	153	159	129,168	133	139		
		133	139	158	164	134,164	138			
										51
					209					
	114									
	140	135	137	157	163	133	137	143	151	
	115	138	140	159	165,216	135	139	145		
	140	137	139	158	164	134	138	144		
	114	135	137	157	163	133	137	143		
	115	138	140	158,201	165,221	135	139	145	152	
	114	136	138	158	164	134	138	144		
251			216							
	139									50
		131	133	153	159	129	135	139	146	
		136	138	157	163	133	137	143	151	
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	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
	261	209	195	224	239	305					
					241	307					
	266		200	231	246	309					
				229		309					
	263	211	196	226	241	306					
					246						
		214				309					
				230							
		215									
				172			173,194		172	195	63
				174			178	146	152		
		161					174		171	198	
									171	199	
							174				
		156	144	146	165	171	142,175	146	152	203	
							176				
	218	190	169	208	250	289	259	234	187	130	
	187		65	70	228	102	72	165			
					90	309			170		
					6	5					
	76	62								106	73
					253						
				184	206	267	243	206			
				201							
	76	62	61								
		293									
					183						

	1952	1953	1954	1955
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										51
	152									
	2,149				102	72	80	82	103,108	52
	156								202	
	153									52
				91					110	52
				92						50
										57
				91					109	52
				89					152	
2,61	1,47	18	31	32	45	25	56	37		
	50									
	53	23	37	38	54			47		
	52	22	35	36	49			41		
	50	21	36	37	50			44		
	48									
	49	20	33	34	47			39		
	50	21	34	35	48					
	52	23	37	38	51			46		
	49									
61								27		
							4			
						240	197			
4,230		172	192	213	274	261,280	214	189	224	110
		83	88	111	117	87	94			
262	210	197	227	241	307					
274	220	207	238	258	318	292	245	213		
272	219	205	236	256	315	290	243	211		
					306					
	185	83,162	88,187	111,209	117,269	87,245	94,208	177		
				88						
					295					
			228	244						
				244	308				150	
66	56	83	88	111	117	87	94	100		
					15					

	1952	1953	1954	1955
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	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
	68	57									
	68	58	69	75	99	107	75	83	89		
			70	76	100	106	76	84	90		
	151	178	158	161	180	186	158	126,160	166		
			214	49,240	50,264	32,67	37,58	68			20
	17	14	33	46	46	63,338	33,308	248		59,70	21
					48	64				60,64	
						66					
	17	14	33	46,240	46,264	63,326	36,296	67,248	59		
	19	16	34	47	49	67					
	25	21	41,214	55,252	46	338	308	248	215		
	43,288	31	216	254	63	100	65,310				
							54				
										245	
										70	
					51	69	58	75	72		20
				240	264	326	296			64	
			83	88	111	117	87	94			
									200		
										128	
									167	205	
	22	19	38	52	91	74					50
					55						
										74	
										83	
										75	
											80
											74
					243						
					92					111	57
	254	202	193	220	236	300	287	242	209		
										172	
										175	
										179	
										178	
					55	74					
					280						
	293	299	221	257							

	1952	1953	1954	1955
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1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
							215			
265	213	197		243						
188	152	140,199	142	90,161	167,296	138	142	148		51
146		139	141	160	166	136	140	146		
										64
						162				
		198								
							175,203	180	169	
188							166		154	52
						52		63	71	
15	13	218	256			312				
		31	43	43	59					
	215									
2,84	2,74	58	71	68	103	73	80	83	103,187	
90	76	85	90	113	119	89	95	101	188	
90	80	88	93	116	122	94	100	104		
90	80	88	93	116	122	92	98	104		
90	80	88	93	116	122	96	98	104		
89	85	93	99	121	127	97	103	109		
	78	87	92	115	121	91	97	103		
								86		
90	80	88	93	116	122	93	98	101		
256	204	194	222	238	303	289	242	210		
94	84	92	98	120	126	96	102	108		
85	76	85	90	113	119	89	95	113		
				84			79	176		
208	180									
			184	206	267	243	206			
										106
						161				
209	181	161	190	211	272	251			212	
218	190	169	208	228	289	259	234	187	129	

	1952	1953	1954	1955
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ages under 50			50	
divorced people				

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
	250	214		231	245						
	251	226									
		214				309					
			200								
	4,261	2,209	195	224	239	305					
		214									
		214	200		246	309					
							162	215			
										79,83	51
	187		65		193		137	141	147	152	
	126	133									
	139						137	141			
	137	133									
					183						
	2,11	1,9,31	27	41	5,41	4,57	33	202	64		
	274		207	238	258	15	318				
										175	
										173	
										180	
										179	
										178	
	146									152	51
	126,147	2,110	63		87	102	72	79	82	195	63
							176				
							174				
		156	144	146	165	171	142,175	146	152	202,203	
							176				
				230	245						
					253						
	5,8	8	5	8	10	10		43	12,28		
						209					
				164				17-23	28		
	2,48	1,32	7	10	12	20	8	49	17	39	
						29,358					
	61			17	20	28					

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			10	12	20			17		
								17		
								21		
			10	12	20			20		
			12	15	23					
59	40	15	28	29	44					
						21				
51	35	10	13	16	24					
53	35	10	19	21	38					
255	203	194	221	237	34					
48	32	7			303	287		19		
48,255	32,203	7,194	10,221	12,237	20,303	8,287				
255	203	194	221	227	303	287			243	
58	39	14	24	26	42			33		
	41					17,19				
55	38	13	22	25	40				42	
117	104	120	122	142	148	118	122	128	213	79
			73	93	103	73	81	83	183	
			99	105	137	107	113	119	184	
			99	105	132	102	108	116		
18	15	34	47	47	64	35	66	59		
					58					
		83	88	111	117	87	94	100		
		185	206	230						
250					295					
252	297	219	217	278	297					
250			216		295					
252	298	220	218	278	296					
			217							
			217							
251										

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1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
		83	88	111	117	175,200	94	100		
				246		87				
					296					51
		199								
			216		309					
				243						
				6	6	4	28-38	4	30	
									31	
									31	
							30			
							31			10
							33			
									34	
										4
									33,35	
									30	
									34	
								7		
					14					
							36		5	
						63				16
4,230	6	172	192	213	274	261	214	189	222	97
208	180	161	184	206	267	243	206	176	211	73
						174,197				
252										
251			217							
2,65	2,55	52	69	65	101	71	79	81	99	
66	56									
									144	
									145	
									146	
									144	
65	55									
65	55						162			
76	67	56								
66	56								144	
		55	164		103	73	81	83	105	
			73						129	
217	189	168	206	227		261	236			

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						71	79	81		
69	59								154	
67	56	63				73				
158	164	148	150	170	103,175	146,235	150	156		63
33	29	48	58	60	86					36
38					91					41
146										90
188							169		153	
271	3,218	204	235	255	314					
3,126	2,110	63		87	102	72	79	82	107,149	50
108	95									
109	97	119	121	141	147	117	120	126		
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