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CRIME AS OPPORTUNITY
A NOTE ON DOMESTIC GAS SUICIDE IN BRITAIN AND THE NETHERLANDS

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The marked decline of the suicide rate in England and Wales following detoxification of the domestic gas supply during the 1960s and 1970s has been used as evidence to support the case for preventing crime through reduction of criminal opportunities. The apparent absence of displacement to other methods of suicide has been regarded as especially significant. The present study investigates the seemingly lesser effect of detoxification on the overall suicide rates of Scotland and the Netherlands. While this reduced effect might be indicative of displacement, it is concluded that the fall in suicide resulting from detoxification may have been masked by a rise in other forms of suicide in these countries, coincident to, rather than consequent upon, detoxification. Implications for the study of crime displacement and criminal innovation are briefly discussed.

The elements of the Home Office's 'situational approach' to crime prevention (Clarke and Mayhew, 1980; Heal and Laycock, 1986) are to be found in 'Crime as Opportunity' (Mayhew *et al.*, 1976), where it was argued that criminologists had neglected not only the situational determinants of crime but also the associated preventive possibilities afforded by a reduction of criminal opportunities. This position, labelled 'situational control theory' by Downes and Rock (1982), made much play of a study by Hassall and Trethowan (1972) showing that suicides in Birmingham had declined sharply following a reduction in the toxicity of the domestic gas supply—new manufacturing processes dependent upon oil rather than coal were yielding gas with a much smaller percentage of lethal carbon monoxide. Few of the people prevented from poisoning themselves with gas killed themselves in some other way. This seemed especially significant since suicide is usually regarded as more deeply motivated than most crime; crime might therefore be even more greatly affected by reducing opportunities.

The new gas manufacturing technology had been introduced throughout the country from the late 1950s onwards, and a further change came between 1968 and 1977 with the conversion to North Sea gas, which is free of carbon monoxide. It might therefore have been expected that the reduction in suicide first reported for Birmingham would manifest itself more widely, and this indeed proved to be the case: between 1963 and 1975 the national rate of suicide declined by nearly 40 per cent, precisely in step with the decline in gas toxicity (Kreitman, 1976; Low *et al.*, 1981; Kreitman

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and Platt, 1984; Clarke and Mayhew, 1988). Suicide by gas, which at its height at the end of the 1950s had accounted for 50 per cent of all suicides in England and Wales, had been all but eliminated by 1975.

This might seem incontestable evidence of the important part played by opportunity in suicide; although suicidal motivation is powerfully affected by personal and social circumstances, it appears that the urge to kill oneself may be quite temporary, and only translated into action where circumstances are favourable—including the availability of a suitable method. However, this view of suicide does not fit the prevailing model, which regards suicidal motivation as more deeply rooted and inexorable. Nor is it consistent with the general assumption (cf. Stengel, 1964) that, faced with a reduction in the availability of a particular method, a suicidal individual would find some acceptable alternative (the 'displacement' hypothesis). Consequently, much effort has been devoted to advancing alternative explanations—other than detoxification of the gas supply—for the decline of suicide in England and Wales, with the result that Downes and Rock (1982) have suggested that the claims of situational control theory might need to be modified in the light of doubt cast on the detoxification evidence.

The present authors have elsewhere (Clarke and Mayhew, 1988) reviewed the evidence that the decline of suicide in England and Wales was the result not of detoxification, but of concomitant changes in the International Classification of Diseases under which suicides are recorded (cf. Kreitman, 1976; Sainsbury, 1983; Bulusu and Alderson, 1984); improved medical, psychiatric and ambulance services (cf. Brown, 1979); the expanded network of the Samaritans (cf. Bagley, 1968; Barraclough *et al.*, 1977); and improved economic and social well-being in the country (cf. Sainsbury *et al.*, 1980; Boor, 1980; Kreitman and Platt, 1984). None of these suggestions is well supported by data, nor is the evidence convincing (cf. Clarke and Mayhew, 1988) that towns whose gas supplies were detoxified later in the period had the same pattern of decline in suicides as towns detoxified earlier (Sainsbury, 1986). It seems reasonable, therefore, to conclude that the overall decline of the national rate of suicide for England and Wales in the 1960s and 1970s was due to the elimination of domestic gas poisoning as a method, and, further, that this observation constitutes powerful evidence of the role of opportunity in suicide. This latter conclusion has been strengthened by other research which has suggested that rates of suicide might also be related to the availability of some other lethal agents, such as firearms (e.g. Farmer and Rohde, 1980; Lester, 1987; Markush and Bartolucci, 1984) and barbiturates (Oliver, 1972; Whitlock, 1975).

One possible inconsistency in the evidence relating to detoxification remains, however, which concerns its effect in some other countries: while reductions in *gas* suicide have invariably been observed, commensurate falls in *overall* rates of suicide have not always occurred. For example, while overall rates of suicide did decline following detoxification in Australia (Whitlock, 1975) and Vienna (Farberow and Simon, 1969), they barely did so in the Netherlands (World Health Organization, 1982) and in Basle (as claimed by Stengel, 1964, but with no supporting data). Closer to home, detoxification had less effect on the overall rate of suicide in Scotland than in the remainder of Britain (Kreitman, 1976).

On the face of it, these findings call into question the generality of the detoxification effect. Indeed, it could be argued (*a*) that detoxification might have had a larger effect upon the overall suicide statistics in England and Wales than elsewhere because of the stronger link in that culture between the idea of suicide and 'putting one's head in the

gas oven'; or, (*b*) that a nation widely regarded as conservative in its way of life would also be conservative in its chosen ways of death. None the less, lack of displacement following detoxification has usually been attributed to the particular advantages of domestic gas—even though there have been no specific studies of the its 'attractiveness' compared to other methods of suicide. It was widely available, required little preparation or courage, did not disfigure, and was painless and bloodless (cf. Brown, 1979; Clarke and Mayhew, 1988). These advantages were likely to appeal generally to the suicidally inclined and, if this were so, there would have been limited displacement in any culture following gas detoxification.

Accordingly, the present paper investigates an alternative hypothesis to that of displacement for the apparently more limited detoxification effect in some countries: that the effect of the drop in gas suicides on the overall rate of suicide was masked not by displacement but by an unrelated, general increase in the propensity to commit suicide. For purely arithmetic reasons, such masking is most likely to have occurred where gas suicides formed a smaller initial proportion of the total.

This hypothesis is examined here in the context of a comparison of patterns of suicide for England and Wales, Scotland, and the Netherlands during 1960–75—years encompassing the different periods of detoxification in the three counties. As shown in the Appendix, detoxification had its main effect on carbon monoxide levels as follows:

Country	*Period*	*Decline in CO* (%)
England and Wales	1962–71	11·5–0·5
Scotland	1962–75	13·2–0·7
Netherlands	1963–68	12·3–0·2

In the light of criticisms frequently made of international comparisons of suicide rates (e.g. Farmer and Rohde, 1980), and especially of the controversy surrounding differences in the suicide rates of Scotland and England and Wales (Ross and Kreitman, 1975), it should be noted that the present study compares not rates of suicide between countries but patterns of change within each country consequent upon detoxification. Such comparison should be less vulnerable to variations between countries in procedures for ascertaining and recording suicide. Indeed, more problematic than the suicide data may be those concerning the gas supplies in each country, since some of these had to be estimated for this research (see Appendix for data and sources).

Effect of Detoxification on Numbers of Suicides

It can be seen from Fig. 1 that, in all three countries, detoxification of the gas supply resulted in the virtual elimination of *gas* suicides. (A few took place none the less since it is still possible, though much more difficult, to commit suicide with domestic gas even when the supply is free of carbon monoxide). There is a very close correlation (in all cases significant beyond the 1 per cent level) between the declines in the carbon monoxide content of the total gas supplies and the declines in the numbers of gas suicides.[1]

To show the effect of detoxification upon *overall* rates of suicide, crude suicide rates (i.e. uncorrected for changes in population structure) per million of the population in

[1] Alternative measures of toxicity—based upon the yearly proportion of households in each country supplied with manufactured gas and (for England and Wales and Scotland) the average CO content of gas supplied to just those homes—produced slightly poorer but still close fits with numbers of gas suicides.

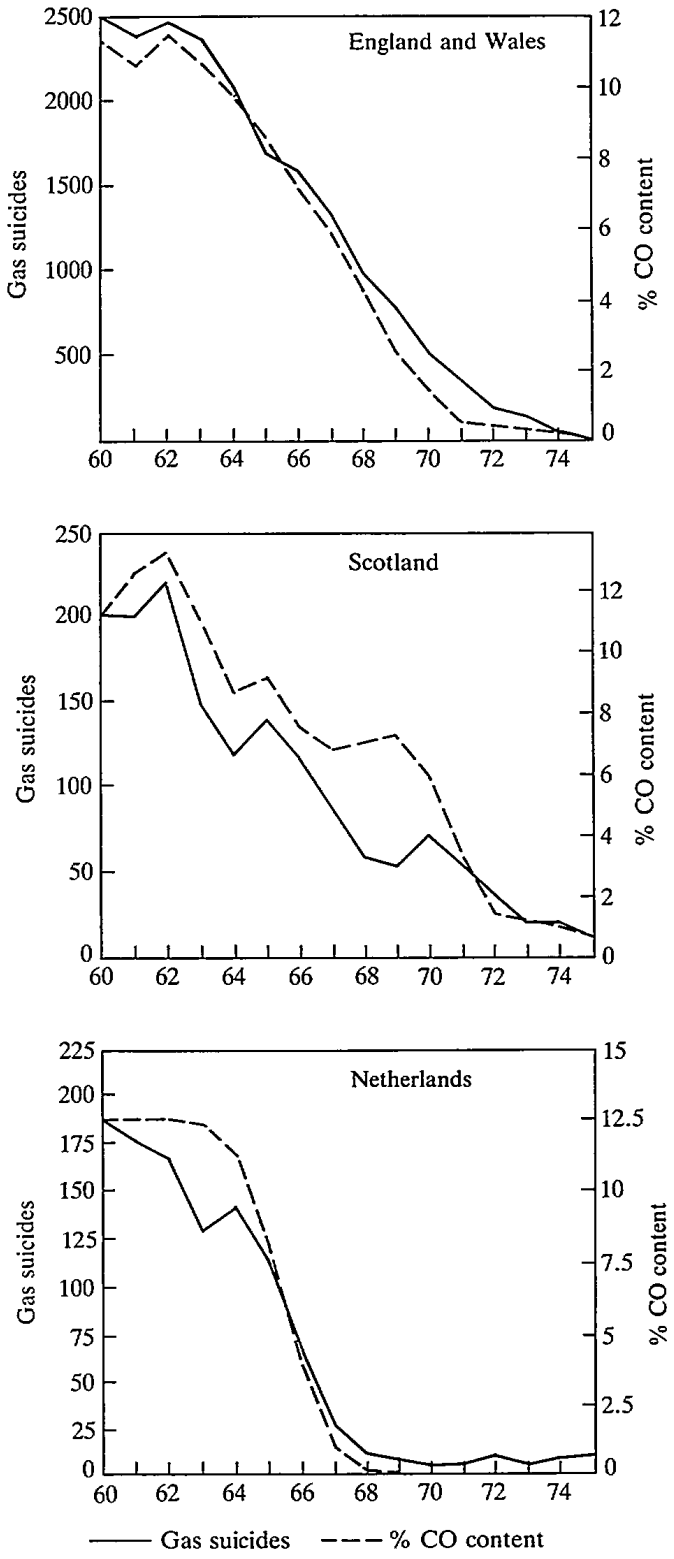

FIGURE 1. Gas suicides and CO content of gas, 1960–1975

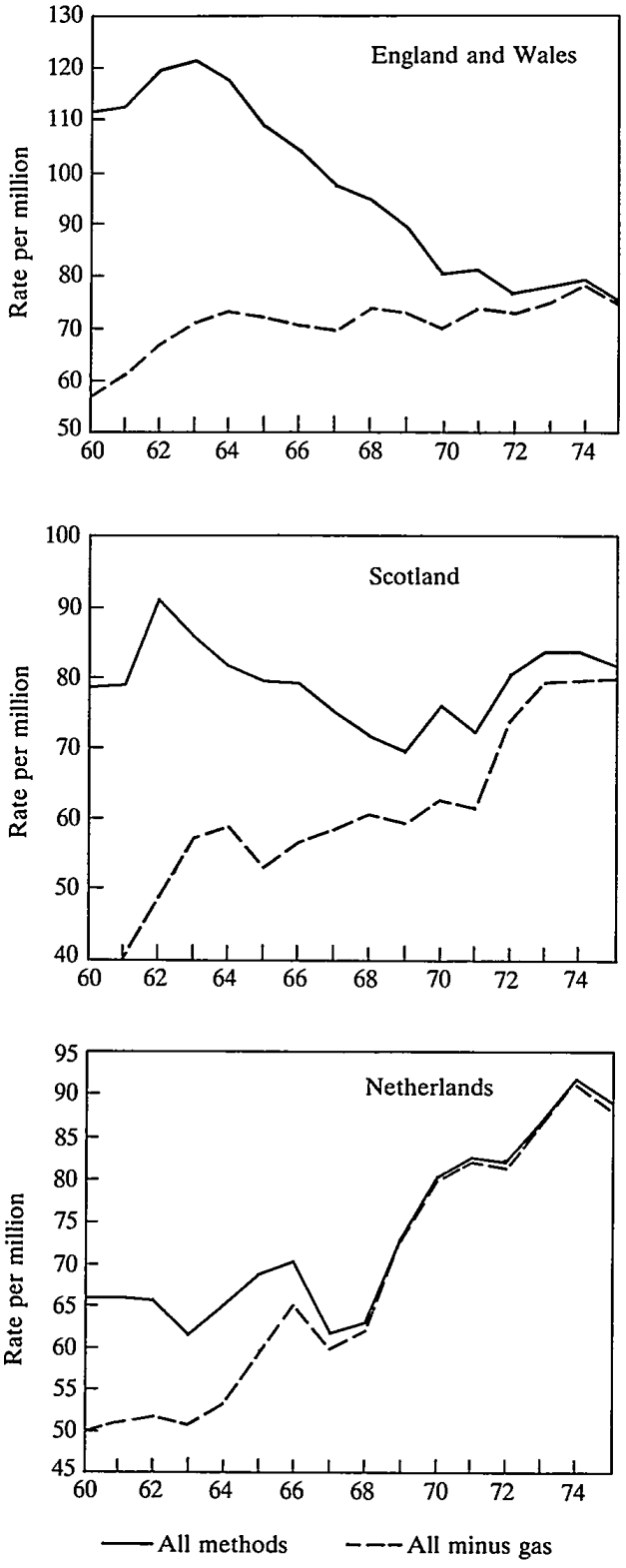

FIGURE 2. Suicide rates by method, 1960–1975

each country are given in Fig. 2 for (*a*) all methods of suicide (upper line in each graph), and (*b*) all methods except domestic gas (lower line).

For *England and Wales*, the overall rate of suicide fell by 38 per cent between 1963 and 1975 (from 121 to 75 per million). During the same period there was a small (5 per cent) rise in suicides by all methods other than domestic gas. This, at best, suggests only very limited displacement insofar as successful suicide is concerned.[2] (More detailed analysis suggests that any displacement that occurred was greater for males and for the young; Clarke and Mayhew, 1988).

For *Scotland*, the suicide rate fell by about 30 per cent between 1962 and 1971 (from 91 to 72 per million). Thereafter, it began to rise again, and by 1975 had reached 93 per cent of its 1962 level. Thus, the fall due to detoxification in Scotland appears to have been somewhat smaller and of shorter duration than in England and Wales. Arguably, this lesser effect of detoxification on the overall rate of suicide was due to displacement, but this would entail the somewhat unlikely proposition that displacement was greatest in the period 1971–75, when CO levels declined least. Equally consistent with the available facts, moreover, is the hypothesis that the rise in the overall level of suicide after 1972 was the result of a long-standing increase in the tendency to suicide, considerably pre-dating detoxification (Kreitman, 1972; World Health Organisation, 1982), the effect of which between 1962 and 1971 had been masked by the decline in gas suicides. The reasons for the increase in suicidal tendencies in Scotland lie outside the scope of this discussion, but factors such as declining employment rates or a worsening economy might be implicated (Krietman and Platt, 1984).

For the *Netherlands*, despite the virtual elimination of gas suicides by 1967 and a 10 per cent drop in the overall suicide rates for 1967 and 1968, the rate in 1968 (62 per million) at the end of detoxification was no different from the rate in 1963 at the beginning (61 per million). This lesser effect of detoxification might have been expected, given that gas suicides were always less common in the Netherlands (only 25 per cent of all suicides in 1960 were by gas compared with almost 50 per cent in both Scotland and England and Wales). None the less, during the period in which detoxification took place, non-gas suicides increased by about 30 per cent, which might be taken as evidence of displacement. However, non-gas suicides also increased at about the same rate *after* detoxification, from 61 per million in 1968 to 88 per million in 1975. Once again, therefore, these facts are consistent with the hypothesis that a general increase in the tendency to commit suicide in the Netherlands, which began in the early 1950s (World Health Organisation, 1982) and which continued throughout the period of detoxification and after, masked the effect of detoxification on the overall rates of suicide. Such an increased tendency to commit suicide in the Netherlands need not, of course, have had the same origins as in Scotland.

Changes in Methods of Suicide

Closer analysis of the methods employed in suicide might, in theory, clarify the reasons for the smaller effect of detoxification on the overall rate of suicide in Scotland and the

[2] There may have been some displacement involving less lethal methods such as overdosing, but the incomplete recording of attempts provides no measure of its extent. Nor is it known when people became aware of the reduced toxicity of gas; for a time, gas may still have been used by those seeking to kill themselves. The critical point, however, is that there was little displacement involving equally lethal methods. As a result, detoxification saved a substantial number of lives—6,700 according to Wells (1981).

Netherlands. For example, if it were found that the decreases in domestic gas poisonings had been matched by increases in a similar method, such as poisonings by solid or liquid substances, this might be taken as evidence of displacement. However, if there were a more general rise in all forms of suicide, or in methods such as jumping from a high building—which, at least in terms of the sex and age distributions of those involved, and possibly also in terms of precipitating motive and lethality of intent, are rather different from domestic gas poisoning—then this might be seen as evidence of a coincident rather than consequent rise in these suicides.

Unfortunately, such analysis does not unequivocally support either explanation. In Scotland, consistent with a displacement hypothesis, most of the increase in forms of suicide other than domestic gas poisonings was accounted for by an increase in poisonings by solid and liquid substances (which increased from 51 in 1960 to 200 in 1975). Half of this increase, however, had already occurred by 1962 (125 poisonings by solid and liquid substances), i.e. before the start of detoxification. In the Netherlands there was a substantial increase in poisoning by solid and liquid substances (from 71 incidents in 1960 to 295 in 1975), but about half of this increase occurred in the period *after* detoxification was complete. These further increases in the period after detoxification cannot have been compensatory for reductions in gas suicides and cannot therefore be indicative of displacement. Rather, it would seem that increasing numbers of suicidally inclined individuals were taking advantage of the easy opportunities for overdosing provided by barbiturates and other widely available drugs. That there may have been a more general increase in suicidal motivation is indicated also by a substantial rise (from 18 incidents in 1960 to 95 in 1975) in jumping from a high building, and a general rise in all other forms of suicide.

A footnote to the above is that in both Scotland and the Netherlands, suicides by car exhaust fumes increased considerably during the period (from 2 to 18 incidents for Scotland and from 0 to 14 for the Netherlands). Because of the small numbers this does not affect the overall conclusions, though similar increases were observed in Australia around the time of detoxification (Burvill, 1971), and have more recently occurred in England and Wales (Clarke and Lester, 1987). These increases in car exhaust suicides, particularly for England and Wales, could conceivably be the result of displacement—i.e. alternative action on the part of particular individuals frustrated from following their planned course. More likely, though, is that they signified 'innovation'—i.e. the process through which populations exploit or develop 'new' methods of committing suicide or crime. And sometimes, of course, as may be the case in the present example, innovation can be stimulated by a decrease in formerly available opportunities.

Gas Suicide in the Netherlands Prior to Detoxification

Cultural traditions may have meant that domestic gas poisoning played less of a part in Dutch suicide, but there may also have been less opportunity to use gas, a supposition supported by the fact that accidental deaths by domestic gas poisoning (E890 in the International Classification of Diseases) were also markedly lower in the Netherlands. In 1956–59 these deaths averaged about 5·4 per million of the population, compared with an average of 18·3 per million for England and Wales and 20 per million for Scotland. While the gas supply in the Netherlands was no less toxic in 1960, fewer Dutch households received a toxic gas supply (about 59 per cent compared with about 75 per

cent in England and Wales and 66 per cent in Scotland—see Appendix). In addition, fewer Dutch homes appear to have had gas ovens and fires[3]—the appliances most commonly used for suicide—and there were also important design differences that would have made these more difficult to use for suicide (J. A. Vernout, personal communication, 19 Mar. 1987). Unlike most British ovens, which had side-opening doors, the doors of Dutch gas ovens invariably opened downwards which would have made it harder for people to put their heads inside. And, unlike most British gas fires, which had an 'open' flame, the flame of Dutch gas fires was enclosed behind a fixed glass door: this, again, would have made these appliances much harder to use for suicide.

Summary and Conclusions

Previous research has established that the substantial decline in the suicide rate of England and Wales from 1963 to 1975 was the result of detoxification of the domestic gas supply. This finding, which attributes an important causal role to opportunity, has profound implications for the understanding and prevention of both suicide and crime. In particular, the fact that a reduction of opportunities has so marked an effect on behaviour commonly regarded as deeply motivated has been thought to provide considerable support for situational crime prevention; even critics of situational prevention have usually been prepared to concede that it may have a part to play in the control of more opportunistic offences such as theft and vandalism (Trasler, 1986).

The present study has investigated the reasons for the smaller effect of detoxification on the overall suicide rate of Scotland and the Netherlands. In particular, it sought to show that coincident increases in the tendency to commit suicide in these two countries might have masked any effect of detoxification. Evidence was found consistent with this hypothesis, though it did not permit refutation of the alternative hypothesis, i.e. that detoxification resulted in a displacement to other methods of suicide.

There may be few crimes for which opportunities could be almost as completely eliminated as they were for domestic gas suicide. Moreover, blocked opportunities for any single category of crime can result, in theory, in displacement to a wide variety of other offences. This means that detecting such displacement simply through analysis of crime rates, especially when these are generally increasing, may often be all but impossible. Cornish and Clarke (1987) have therefore suggested a fresh approach to the study of displacement which would employ interviews with offenders to establish the 'choice structuring properties' (i.e. perceived availability, costs, and benefits) of a variety of different crimes. Degrees of communality between offences in these properties ought to help in anticipating the direction and amount of any displacement or innovation. Information about how knowledge comes to be shared among offenders about the choice-structuring properties of existing and new forms of crime would also be helpful, and here a case study approach, as recently pursued by Tremblay (1986) in his research

[3] Approximately 4 per cent of Dutch homes had gas fires in the early 1960s (Peebles, 1980, p. 132) compared with about 12 per cent of households in England and Wales and 9 per cent in Scotland in 1964. (These latter estimates were derived from data for the conversion programme, which show that in 1964 there were 3·73 million fires in England and Wales and 280,000 in Scotland; it was assumed that there were an average of two gas fires per household with such fires.) As for ovens, according to conversion figures, something over 90 per cent of households supplied by gas in England and Wales and over 80 per cent in Scotland may have had a gas oven in 1964 (unpublished British Gas data), whereas according to an official at the Dutch Veg-Gasinstituut, the pre-conversion figure for the Netherlands was only about 50 per cent (J. A. Vernout, personal communication, 19 Mar. 1987).

into credit card fraud in Canada, may be especially valuable. The resultant knowledge could facilitate the design and implementation of more effective situational preventive measures.

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Appendix

TABLE 1

Population, suicides, and the domestic gas supply, 1960–1975, England, Wales, and Scotland

	Population[a] (millions)	Suicides[b] All	Suicides[b] Gas	Households (millions) All[c]	Households (millions) With gas supply[d]	Households (millions) Natural gas[d]	CO content (%)[e] Total supply	CO content (%)[e] Manufactured supply
				ENGLAND AND WALES				
1960	45·8	5,112	2,499	14·6	11·08	—	11·3	11·3
1961	46·2	5,200	2,379	14·7	11·07	—	10·6	10·6
1962	46·7	5,588	2,469	15·0	11·07	—	11·5	11·5
1063	47·0	5.714	2,368	15·1	11·07	—	10·7	10·7
1964	47·4	5,566	2,088	15·4	11·13	—	9·8	9·8
1965	47·8	5,161	1,702	15·6	11·19	—	8·6	8·6
1966	48·1	4,994	1,593	15·8	11·35	—	7·2	7·2
1967	48·4	4,711	1,336	16·0	11·50	0·01	5·8	5·8
1968	48·6	4,584	988	16·2	11·67	0·05	4·2	4·4
1969	48·8	4,326	790	16·4	11·76	0·45	2·5	2·9
1970	49·0	3,940	511	16·6	11·86	1·64	1·4	1·9
1971	48·8	3,945	346	16·9	11·91	3·71	0·5	1·0
1972	49·0	3,770	197	17·0	11·97	6·05	0·4	1·2
1973	49·2	3,823	143	17·2	12·10	8·17	0·3	1·7
1974	49·2	3,899	50	17·3	12·18	10·26	0·2	1·7
1975	49·2	3,693	23	17·4	12·31	11·81	0·0	0·5
				SCOTLAND				
1960	5·18	408	200	1·54	1·03	—	11·1	11·1
1961	5·18	409	199	1·57	1·03	—	12·4	12·4
1962	5·20	473	219	1·58	0·99	—	13·1	13·1
1963	5·21	445	149	1·58	0·97	—	11·0	11·0
1964	5·21	425	119	1·59	0·94	—	8·6	8·6
1965	5·21	415	139	1·59	0·93	—	9·0	9·0
1966	5·20	413	118	1·60	0·91	—	7·5	7·5
1967	5·20	391	87	1·62	0·90	—	6·7	6·7
1968	5·20	373	59	1·65	0·89	—	7·0	7·0
1969	5·21	362	53	1·67	0·88	—	7·2	7·2
1970	5·21	397	71	1·69	0·87	—	5·9	6·1
1971	5·22	378	55	1·71	0·85	0·04	3·4	4·3
1972	5·21	421	37	1·72	0·83	0·16	1·5	2·0
1973	5·21	436	21	1·73	0·82	0·22	1·2	2·0
1974	5·22	437	21	1·74	0·81	0·32	1·0	2·0
1975	5·21	427	11	1·75	0·81	0·42	0·7	2·0

[a] *Annual Abstract of Statistics* ('mid-year estimates' of population).

[b] *Figures for England and Wales are from the Statistical Review of England and Wales, Part 1B, Medical* (1960–73) and *Mortality Statistics, DH4* (1974–75). Figures for Scotland are from the *Annual Report of the Registrar for Scotland.*

[c] Series interpolated on the basis of census figures for 1961, 1966, 1971. For England and Wales, interpolations from 1969–75 supplied by the Housing Statistics Branch of the Central Statistical Office; remaining years interpolated by authors.

[d] Complete series supplied by British Gas, though figures for some years are available in *Statistical Digest*, Ministry of Power (1960–67); *Digest of the United Kingdom Energy Statistics*, Dept of Environment (1968/69–1974/75); *Reports and Accounts for the Year Ended 31st March* .... Gas Council (1960–72); and British Gas Corporation (1973–75).

[e] Unpublished estimates by British Gas. These figures were calculated for this study and were derived by weighting the proportions of different kinds of gas supplied in each year by the following estimated values for CO content: natural gas and refinery gas, 0%; coal gas, 7·5%; blue water gas, 40%; carburetted water gas, 30%; oil gasification (cyclic), 20%; oil gasification (continuous), 4%; producer gas, etc., 28%; coke oven gas, 7%.

TABLE 2

Population, suicides, and the domestic gas supply, 1960–1975, The Netherlands

	Population[a] (millions)	Suicides[b] All	Suicides[b] Gas	Households (millions) All[c]	Households (millions) With gas supply[d]	Households (millions) Natural gas[e]	CO content[f] (%)
1960	11·6	762	187	3·20	2·10	0·21	12·5
1961	11·7	774	176	3·26	2·16	0·22	12·5
1962	11·9	781	167	3·31	2·23	0·23	12·5
1963	12·0	742	129	3·37	2·27	0·26	12·3
1964	12·2	792	141	3·42	2·32	0·45	11·3
1965	12·4	850	114	3·49	2·39	1·02	8·2
1966	12·5	881	68	3·56	2·55	1·86	4·0
1967	12·7	783	27	3·64	2·66	2·49	1·0
1968	12·8	806	12	3·71	2·79	2·76	0·2
1969	13·0	942	8	3·79	2·94	2·92	0·1
1970	13·1	1,051	5	3·86	3·11	3·10	--
1971	13·3	1,090	6	3·92	3·24	3·23	—
1972	13·4	1,094	10	3·98	3·48	3·48	--
1973	13·5	1,164	5	4·06	3·55	3·55	—
1974	13·6	1.247	9	4·13	3·79	3·79	—
1975	13·7	1,219	11	4·21	3·85	3·85	—

[a] *75 Jaar Statistiek van Nederland*, Central Bureau voor de Statistiek.

[b] *Overledenen naar Doodsoorzaak, Leeftijd en Geslacht in Hetjaar*, Centraal Bureau voor de Statistiek.

[c] Series interpolated on the basis of figures for 1960, 1964, 1967, 1970, and 1971 from *Statistical Yearbook of the Netherlands*.

[d] *Annual Bulletin of Gas Statistics for Europe*, Economic Commission for Europe, Geneva. New York: United Nations.

[e] Calculated on basis of following data supplied by Veg-Gasinstituut for proportions of connections receiving natural gas: 1961, 10·0%; 1962, 10·4%; 1963, 11·6%; 1964, 19·3%; 1965, 42·7%; 1966, 72·8%; 1967, 93·6%; 1968, 99·1%; 1969, 99·3%.

[f] Veg-Gasinstituut indicated that in the early 1960s about 10 per cent of gas supplied in the Netherlands was natural gas with no carbon monoxide, 10 per cent was manufactured gas with a CO content of about 5 per cent, and the remainder was manufactured gas with a CO content of 15%. The yearly estimates of CO content for the total gas supply were calculated on the basis of weighting these figures by those for the yearly proportions of natural gas connections reported in n. *e*. Because of the imprecision of the estimates of CO in the manufactured supply and because these levels did not vary during the period under study, no attempt was made to include these figures in the analyses conducted in this paper. (It should be noted that the vertical axis of Fig. 5 in World Health Organisation 1982 is mislabelled according to the Veg-Gasinstituut (A. C. Koelwijn, personal communication, 16 Dec. 1986); it illustrates not average CO content of the gas supply in the Netherlands but the proportion of all gas supplied that contained carbon monoxide).