

SUICIDE IN HELSINKI

**An epidemiological and socialpsychiatric study of suicides
in Helsinki in 1960–61 and 1970–71**

**Monographs of Psychiatria Fennica
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**An Epidemiological and Socialpsychiatric Study of Suicides
in Helsinki in 1960–61 and 1970–71**

by JOUKO LÖNNQVIST

Monographs of Psychiatria Fennica

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PREFACE

Suicide is one of the commonest causes of death and as such presents a serious public health problem. The World Health Organization estimated that at least 1000 persons kill themselves every day (WHO 1968). In the countries of Europe and North America suicide ranks among the most frequent causes of death (WHO 1976). In Finland annually more than 20 persons per 100,000 have committed suicide.

Research remains the basic process for furthering our knowledge of suicide and its prevention (Farberow et al. 1973). In Finland suicidological research has been judged to be a far advanced and well-established field of study which — dealing with a problem that is nationally significant and at the same time one of the central problems of clinical psychiatry — which should be given particular support (Academy of Finland 1976). At the Psychiatric Clinic of the University of Helsinki, suicidological research has been one of the central fields of investigation since 1968.

The present study is part of the author's more extensive suicide research project, the central ideas for which came into being in the years 1969—1971, stimulated by other suicide studies in which he was engaged. Work on the study has been in progress since 1972. The purpose of the project is to investigate the suicides committed in Helsinki in 1960—61 and 1970—71, approaching them from a variety of angles and endeavouring to integrate these various approaches finally into the most well-rounded picture possible of suicides of the years concerned.

This research report consists of two parts. Part I considers the concept of suicide and the relationship of suicide to self-destructive behaviour in general. In addition, it seeks to evaluate critically the reliability of the official suicide statistics and their usability as a basis of scientific research. The goal in Part I is to construct sufficiently reliable, comparable groups of suicides for the purposes of the research project.

Part II of the study considers suicides in an urban community. The approach is a mainly socio-ecological one. An effort is made to examine, in particular, how a process of change of an urban community is reflected in the suicide rates for the various parts of the city concerned and to analyse the relationships of the functioning, well-being and mental health of the community to suicide rates.

In the parts of the research project to be published later, suicides will be considered at the individual level, relative to changes that had taken place in the individual's social career and in his mental and somatic health before he committed suicide. Moreover, continuation studies will consider the relations of the persons who later committed suicide to the various helping systems of the community and evaluate the functioning of these systems. Particular attention will be devoted thereby to so-called chronically suicidal persons and, on the other hand, to acute suicidal crises.

PART I

**A CRITICAL EVALUATION OF THE OCCURRENCE
OF SUICIDES IN HELSINKI
IN 1960-61 AND 1970-71**

INTRODUCTION

One fundamental qualification for public health care planning is thorough knowledge of the current situation (Kalimo 1971). Accordingly, also evaluation of the suicide situation and suicide prevention should be based on reliable knowledge about the occurrence of suicides. Most often, however, information on the frequency of suicides is founded on official statistics on the causes of death, the reliability level of which is left uncertain. Studies on the reliability of statistics on the causes of death are extremely few in number, and this concerns especially pertinently suicide statistics. Yet, official data on the occurrence of suicides have often been compared even between different countries, and moreover, rather bold conclusions concerning psychosocial conditions in various countries have been drawn by employing official suicide rates as indicators. On the other hand, the reliability of suicide statistics has very frequently been subjected to quite sharp criticism passing down to nihilistic opinions (Douglas 1967). Nevertheless, statistical data have always been utilized and they will be used still in the future because better information is lacking (Maris 1975).

Numerous different causes have been suggested as having contributed to the unreliability of suicide statistics (cf. e.g. Douglas 1967). Such causes include e.g. negative attitudes toward suicide, and endeavours to conceal them. Consequently, under such circumstances a suicide is readily classified as an accidental or undetermined death. Furthermore, irrespective of attitudes the concept of suicide has easily acquired different meanings in the conduct of practical classification procedures. Another cause for differences is that under dissimilar circumstances the resources for the determination of the cause of death are of very different quality, since for example the intensities of police investigation and forensic medical examinations vary greatly. Likewise, in different areas there is very remarkable diversity in the operation of statisticizing procedures and the publication of statistical data.

The origins of statisticizing the causes of death date back quite a long time in Finland. The Finnish statistics on the causes of death are among the oldest ones in the world since they have been recorded for more than 200 years. Even though research results concerning the reliability of the statistics on the causes of death, and especially suicide statistics, have not been available, it has been presumed generally that Finnish statistics are relatively reliable. In Finland the system of determining the cause of death operates fairly well and statisticizing practice has been estimated as comparatively good. Furthermore, general attitudes toward suicides are fairly liberal in Finland, and at least any large-scale endeavours to conceal suicides are unlikely to occur. Yet, all what has been said above is based only on assumptions, since no studies on the reliability of the Finnish suicide statistics have been published.

Even though Finnish researchers have, indeed, had some confidence in the suicide statistics, still their use has always involved some uncertainty. As the present author was considering to conduct a major project on suicide research, it appeared necessary in that connection to evaluate critically the reliability of Finnish suicide statistics, largely from the starting point offered by the criticism presented in the international literature.

The basic point in epidemiological research is to define the phenomenon which is going to be studied. With regard to suicide research it thus involves the concept of suicide and operationalizing this concept in a clear form for practical work. Yet, the very task of defining suicide in a clear and unambiguous way is an exceedingly difficult thing (cf. e.g. Stengel 1972). Another difficulty in epidemiological suicide research involves measuring the defined phenomenon reliably. In the first part of the present study the author endeavours to approach these two fundamental difficulties in a way which hopefully will produce a more reliable view of the occurrence of suicides in Helsinki in the years 1960–61 and 1970–71 than is evident from the official statistics.

AIMS OF THE STUDY

The primary task of the first part of the present study is to evaluate the number of suicides in Helsinki in the years 1960–61 and 1970–71 and, basing on that evaluation, to set up for further studies two comparable suicide groups, one for each study period.

Additionally, the author examines the connections of suicide with self-destructive phenomena in general, difficulties involving the definition of suicide and the reliability of suicide statistics.

The primary hypothesis was the assumption based on the literature that the official suicide statistics do not offer a sufficiently reliable basis for suicide research and that the statistics for two different periods are not comparable with each other.

SURVEY OF LITERATURE

Definition of Suicide

When conducting mental health research we are time and again faced with the fact that many of the fundamental concepts we employ in defining human behaviour and disorders of mental health are hard to formulate in a clear-cut and consistent way. Accurate definitions of human behaviour are difficult to attain, and if they are adequately generalized they will become too vague to be very convincing. When researchers go to work on relevant concepts, the endeavour to analyze and convey these concepts in comprehensible language leads to selective accentuation and possibly also to differential misrepresentations (Weisman 1973).

It is often claimed that suicide research would have a sounder foundation than other mental health studies because the concept of suicide is considered unambiguous, and hence a more reliable basis for exploration would be afforded. Accordingly, one may quite well question whether it is really necessary to expend precious time arguing a term the meaning of which is so self-evident (Stengel 1972). Bearing such opinions in mind it is interesting to notice that these very issues, the concept of suicide and the reliability of suicide statistics, have been subjected to very extensive and critical discussion in a multitude of suicidological studies (e.g. Shneidman 1963, Douglas 1967, Stengel 1972, Beck et al. 1973, Weisman et al. 1973, Brooke & Atkinson 1974, Shneidman 1974 and 1976, Atkinson 1975a). The definition of suicide does indeed present an important problem.

There are several different definitions for suicide. It is only natural that all these definitions are characterized by the fact that they are bound up with the scientific thinking of the promoter and his time and, moreover, in a broader sense with all contemporary culture. This part comprises a survey of some of the most important approaches to and definitions of suicide, starting from those conceived by Emile Durkheim and moving on to current views.

Durkheim (1897) proposed the following definition for suicide: "The term suicide is applied to all cases of death resulting directly or indirectly from a positive or negative act of the victim himself which he knows will produce this result." Durkheim realized that a definition has to include an inferential judgment. However, he did not regard the ascertainment of the intention of self-destruction as the cardinal requisite for a case of death to be classified as suicide. Durkheim did not dismiss intention as immaterial, but he depended on circumstantial rather than direct evidence. He did not insist on retrospective evidence of suicidal intention for his definition of suicide. Durkheim's explications have been criticized as being too rational (Douglas 1967). Durkheim's categorization to four types of suicide constitutes probably the best-known suicide classification. Nevertheless, it has also been pointed out that Durkheim was not so much interested in suicide per se as he was in the explication of his general sociological method (Shneidman 1963, Pope 1976).

Cavan (1928) regarded suicide as the intentional taking of one's own life or the failure, when possible, to save one's life when death is impending. This definition resembles the one suggested by Durkheim, but as an addition it includes the concept of intentionality. Cavan did not, however, discuss the meaning of this intentionality in any greater detail.

Deshaies (1947) and Schneider (1954) went on with including the dimensions of act, consequence and consciousness in their definitions of suicide. Deshaies concluded that suicide is the act of killing oneself in a continually conscious manner, taking death as a means or as an end. Schneider accepted that motivations are very important in leading up to suicide but he did not incorporate them in his definition (Douglas 1967).

Later developments in explicating the definition of suicide have been characterized by a tendency to observe suicide as one part of more diversified human behaviour called self-destructive behaviour or self-threatening behaviour. Another notable element has been a discussion of the importance of intention, or in a still broader frame of reference, a questioning of the meanings of the so-called suicidal act in general.

Menninger (1938) was one of the first investigators to postulate that self-destructive inclinations may be found in a variety of acts which are not usually considered suicidal. He based his classic theory of death and suicide upon the concept of death instinct and upon the wishes to kill, to be killed, and to die.

Douglas (1967) stated in his extensive treatise that though there is some

general agreement that the intention to die must be in some way inferable in order to categorize the cause of death as suicide, there is still much disagreement on how suicide should be defined and what constitutes adequate grounds for inferring intention. He suggested that a student of suicide should not expect to begin with a clear and distinct definition of what he is studying. In the beginning of the study definitions have to be open-ended and largely unexpressed. It is better to begin with a common-sense understanding of the term suicide. Yet, a suicidologist must at once endeavour to ascertain these everyday meanings concretely when dealing with actual cases. Last, his increasingly formal definitions of suicide (i.e. attempts to close an open-ended approach to define the term suicide) must be made within the context of his attempts to explain the suicidal phenomena: explanation and definition must modify each other.

Douglas has assumed a very critical attitude. He emphasizes the importance of the meanings implied in suicide. He has contributed many fruitful views and approaches to the study of suicide. On the other hand, however, his critical contemplations appear impractical and do not much warrant helpful applications.

Stengel (1972) has taken special interest in defining and classifying suicidal acts. He has pointed out that in the vast majority of suicidal acts there is a degree of uncertainty of outcome. Most people who commit suicidal acts want neither to die nor to live but they want both things at the same time. In one end of the scale there is a small minority in whom the urge to self-preservation is completely overwhelmed by the urge to self-destruction and in the opposite hand of the scale there is a minority in whom the urge to self-preservation prevails over feeble self-destructive tendencies. Stengel found it impracticable to require the ascertainment of intention as the main criterion of the definition, and thus he proposed the following definition: A suicidal act is any deliberate act of self-damage which the person committing the act cannot be sure to survive. This definition regards the suicidal act as risk-taking behaviour and takes into consideration that the large majority of such acts are not fatal. This, too, implies an inferential judgment, but this one is easier than the ascertainment of intention.

Weisman et al. (1973) emphasized that suicide can be seen as a minor example of the over-all prevalence of so-called self-destructive behaviour or life-threatening behaviour.

Suicide may be defined as an act to which an individual resorts in order to bring about a desired result, which need not always be death. The conventional viewpoint is that suicide is a logical outcome of specific antecedent events and dispositions. This standpoint looks for the "cause" of suicide. However, it is far too restrictive to regard suicide as a cause-initiated outcome of specific factors. Suicide must be seen in a sociocultural context. It is not an isolated act within a psychosocial field of a suicidal person.

The least ambiguous element in the definition of suicide is between the living and the dead. There is no dispute about death. On the other hand, the range of acts that can be called suicidal is very controversial. Weisman and his co-workers are unwilling to limit suicide to a specific act initiated in order to die. They have also pointed out that intention and motivation are deceptive criteria when deciding who is and who is not suicidal. It is suggested that the dispute about what is and what is not suicide should be changed to involve the problem what is and what is not life-threatening behaviour. This alternative term, life-threatening behaviour, does not call upon the investigator to make assumptions about intent and outcome. Life-threatening behaviour consists of various forms of conduct. It means that life can be threatened and compromised in many ways, short of death, as well as on different levels of experience.

Shneidman (1963, 1974) has suggested that we should completely abandon the old classification of the causes of death because it entirely omits the role of the individual in his own death and totally disregards the teachings of modern psychodynamic psychology. In Shneidman's opinion it would be better to attempt to conceptualize all human deaths in terms of a motivational dimension of intention toward death. He suggests three large subcategories: intentioned, subintentioned, and unintentioned. An intentioned death is any death in which the decedent played a direct, conscious role in effecting his own decease. A subintentioned death is one in which the decedent played an indirect, covert, partial, conscious or unconscious role in hastening his own decease by such behaviors as imprudence, excessive risk taking, abuse of alcohol, misuse of drugs, disregard of life-extending medical regimen, life style risking death, or the like. An unintentioned death is one in which the decedent played no effective role in causing his own decease, in that the death was due entirely to assault or trauma from without or to non-psychologically tinged failure from within.

Shneidman (1976) has furthermore laid stress on the fact that no one really knows why human beings commit suicide. Indeed, the very person who takes his own life may at the moment of his decision be the least aware of the essence of his reasons and emotions for doing so. Understanding suicide calls for insights drawn from many fields that touch on man's entire psychological and social life. Shneidman defines suicide briefly as the human act of self-inflicted, self-intentioned cessation.

For Kastenbaum (1976) suicide means "what people usually mean by suicide": an instrumental act or a succession of actions through which a person intentionally ends his own existence. Kastenbaum does, in fact, admit that it can be difficult to determine the existence of intention in a particular case, but still it is important to retain the idea of deliberate, conscious actions taken specifically in order to end one's own life. Society still tends to interpret suicide as a calculated consequence rather than simply as an outcome of action. That assumed intentional component renders it possible for us to ask repeatedly:

"Why?" Furthermore, Kastenbaum emphasizes implicitly that here it is an issue not only the mere phenomenon of suicide but also that limited viewpoint from which we wish to approach self-destructive behaviours. Certifiable suicide will be our focus, in spite of the high probability that also many other deaths involve self-destructive components as well.

Beck has pointed out (Beck et al. 1975) that the study of suicidal behaviours has been hampered by semantic confusion, amorphous concepts and contradictory taxonomies. A complete review of the literature on taxonomies and nomenclature of suicidal behaviours has been presented by Beck & Greenberg (1971). In recent years numerous efforts have been made to introduce greater conceptual clarity and order into the study of suicidal behaviours.

The Committee on Classification and Nomenclature, Center of Studies of Suicide Prevention, National Institute of Mental Health, Rockville, Maryland, classified suicidal behaviours into three major groups: completed suicides, attempted suicides, and suicidal ideation (Beck et al. 1973). A completed suicide refers to a willful, self-inflicted, life-threatening act which has resulted in death. Completed suicides include all situations in which the circumstances surrounding the deceased lead to the conclusion that the individual took a positive action with the primary purpose of ending his life. Taking risks for purposes of excitement-seeking has not been included among suicidal behaviours.

The above-mentioned Committee, chaired by Beck, recommended to explore further such aspects of suicide as the degree of certainty of suicide as estimated by the rater, lethality or medical danger to life, intent to die, mitigating circumstances and the method of suicide.

Intent means the degree of the seriousness or sincerity of the subject in his actual deed, in terms of ending his life. This assessment requires inference and judgment. This element should be rated after full search and exploration of all reasonably available sources of data concerning both recent and past behaviour of the decedent. Intent may be judged from the individual's self-reports, but appraisal of intent may also be based on circumstantial evidence. Ambivalence should be recognized. The rater should further attempt to weigh the degree of the decedent's wish not to commit suicide as well as the strength of his desire to commit suicide. The ultimate decision represents some interaction of these variables. In his later studies Beck (Beck et al. 1975, 1976) has shown that it is an oversimplification to categorize intent as a single dimension.

The above review illustrates how difficult it is to conceptualize suicide if one endeavours to delve into the concept deeper than the common-sense level. On the other hand, there always exists the reality that the mode of death is decided through subjective evaluation. For its part again, this subjective evaluation is intricately tied with the common-sense meaning of the concept of suicide (i.e. surrounding society), scientific frame of reference as an attitude-molding factor and formal definitions settled by international agreements. The most important international resolutions include The World Health Organization

recommendations and the criteria for classification presented in the successive revisions of International Classification of Diseases (ICD).

The World Health Organization (1968) has suggested that a suicidal act should be defined as self-injury with varying degrees of lethal intent while suicide would mean a suicidal act with a fatal outcome.

Reliability of the Official Suicide Statistics

Epidemiological, social psychiatric and sociological studies of suicide have been based almost entirely on the employment of official statistics on causes of death. As a rule, researchers have assumed that such statistics are sufficiently reliable.

The acceptance of the statistics as adequately reliable and valid is based on two assumptions. Firstly, the number and degree of validity errors by officials in deciding which deaths are suicides are believed to be few and insignificant. Secondly, errors in the designation of suicides or in the collection of the data on the rates are thought to be randomized so that they do not introduce any systematic bias that would give an unreliable estimate of the relative distribution of suicides (Douglas 1967).

Nevertheless, concerned questioning of the reliability of suicide statistics is by no means a recent pursuit (Dublin & Bunzel 1933). In spite of doubts and criticism statistics have served as the basis of suicide studies in an ever growing degree. Thus for example, most sociological theories on suicide have been based on statistics the reliability of which has remained practically unassessed. The criticism directed toward the use of statistics has generally arisen from experience gained in practical work about errors or the likely occurrence of errors in statistics. It is only in the last few years that studies on the reliability of suicide statistics have been published.

It is hard to imagine any groups of observations that have been subjected to more abuse and misuse than suicide statistics. Much of the abuse of suicide statistics results from what might be described as sheer innocent ignorance. An appreciation of the problems and potentials inherent in the use of suicide statistics will be achieved when it is understood that they are a byproduct

of the legal requirement that all deaths must be registered. Absolute certainty is neither expected nor anticipated. The logic underlying the establishment of specific categories is that each one will provide statistics of maximum utility to the largest number of users of the data (Linden & Breed 1976).

Zilboorg (1936) was one of the first psychiatrists who rejected the official statistics on suicide. He did that for a number of reasons, but all of them implicitly assume that reliability is the basic problem.

Simpson (1950) shared Zilboorg's criticism against the official statistics renouncing them as untrustworthy for testing sociological theories of suicide.

Douglas (1967) has composed one of the most extensive critical treatises on the deficiencies and limitations in employing official suicide statistics. He postulated that all suicide theories dependent on official suicide rates must be questionable. Regardless of the formal definitions, it is clear that officials do in fact use different operational definitions of suicide. Moreover, different officials actually use very different search procedures in trying to get evidence for their decisions in categorizing the cause of death. The gravest error, however, has been the assumption that suicidal actions have a necessary and sufficient, uni-dimensional meaning throughout the world. In addition there are such obvious circumstances as changes in the definitions, changes in the methods of certifying the causes of death, changes in officials entrusted with such certifications, changes in methods of reporting the causes of death, etc. Douglas concluded that studies of the social meanings of suicide will lead us to realize that the fundamentally problematic nature of such social meanings implies that the idea of a "real rate" of suicide is irretrievably a misconception. How many "suicides" there are in a given time depends on the practical grounds which are applied in the observance of the definition. Douglas contends that there are about as many official statistics as there are officials. Hence it follows that official statistics are inadequate data for the study of suicide.

Gibbs (1968) replied in his review of Douglas's book that official statistics are sufficiently reliable for many purposes.

It is generally agreed that current statistics on suicide are grossly inadequate and that comparisons of suicidal incidents, based on available figures, are at best sometimes inaccurate and often misleading (Shneidman 1974). As a rule, suicide is suspected of being grossly understated in the statistics based on cause-of-death certification. Researchers, in general, appear to be cognizant of this problem and usually preface their analyses of findings with a statement regarding under-reporting. However, their stated estimates as to the extent of this gap often differ considerably. While some investigators have sought to overcome this obvious limitation by stating that noticed differences are substantial and could not have resulted from underestimation alone, most have not pondered this at all. Therefore, it is not any surprise that suicide statistics are often quoted without any recognition of the spuriousness of such data (Gorwitz 1975).

What research evidence do we then have at present about the problem of under-reporting? Various estimations have been presented. Dublin (1963) held the opinion that there were a further 30 per cent of suicides over and above the officially reported numbers in the United States of America. Kessel (1965) reported from Edinburgh in 1965 that according to his estimate official figures represent only about 50 per cent of the suicides in the city. McCarthy & Walsh (1966) examined coroner's records from the years 1954-63 for Dublin City and county. On the basis of their examination they concluded that twice as many suicides occurred in Dublin in the ten-year period as were reported officially. Later they went on with their project by examining the coroner's records from 1964-68. From their findings they concluded that the Irish suicide rate is low, though not as low as the official statistics suggest, and that the discrepancy between the official and "true" suicide rates in Ireland is greater than in England and Wales and in Scotland. It was disconcerting to discover that the difference between the official rate and the rate established by the investigators was almost four-fold (McCarthy & Walsh 1975).

Dalgaard (1962) and Ettliger (1964) have observed that the context in which the mode of death is determined may in itself influence that determination. In the Scandinavian countries where suicide is not a matter of concern in regard to the law, the decision is made by officially designated medical authorities who arrive at their conclusions on a balance of probabilities. These different procedures could contribute to different findings as compared with such countries like the United Kingdom where the mode of death is determined by an authority with non-medical training.

Many experts have, however, warned against interpreting the difference between the official statistics and the discoveries made by investigators in an imprudent way, since e.g. the psychiatrists' assessment of suicide, based on probabilities, and that of the officials proceed from two different standpoints (Barraclough 1972, McCarthy & Walsh 1975). Likewise, the investigator's professional training and orientation are of major importance when he evaluates the possibility of suicide, since settling the mode of death as suicide is based explicitly on the evaluation of intention. Investigating intention, again, comes rather within the sphere of a psychiatrist and psychologist than that of a pathologist.

Researchers working in Los Angeles have paid particular attention to the importance of the so-called psychological autopsy in the determination of the mode of death, especially in the case of equivocal deaths (Shneidman & Farberow 1961, Litman et al. 1963). Psychological autopsies focus primarily on the personality elements associated with suicide, such as suicidal intention. The approach is to reconstruct the life style and personality of the deceased, mainly by interviewing the spouse, grown children, parents, physician, and others who knew him well. On the basis of these data it will be attempted to make informed extrapolations over the last days of the victim's life and then

to make conclusions for final integration with other findings. The psychological autopsies may result in raising or lowering the apparent suicide rate. Uncertainty about the correct certification results especially when the victim's intention is ambivalent, when the self-destructive action is in itself inconclusive or when death follows after a considerable delay. The term "equivocal suicide" is used in Los Angeles Suicide Prevention Center and the Institute for Studies of Self-Destructive Behaviors to describe those cases in which suicide is a possibility but in which the decision is uncertain and doubtful. The relative frequency of equivocal suicides may be estimated as two per mil of all deaths and ten per cent of all suicides (Litman et al. 1963). After investigating 100 equivocal suicides by conducting a psychological autopsy the original certification was changed in nineteen cases: eleven accidents were reclassified as suicides and eight suicides as accidents or natural deaths. Altogether 55 out of 100 cases were certified as suicides.

In recent years some studies have been published in England, Scotland and Ireland in which attempts have been made to estimate the probability of suicide in deaths officially classified as accidents or undetermined deaths.

McCarthy & Walsh (1975), for example, reported that in Dublin 18 cases (9 %) of their 210 suicide deaths had been recorded officially as accidental deaths. Ovenstone (1973) found that only one of her 214 suicide deaths in Edinburgh had been recorded officially as an accidental death.

Particular difficulties in the determination of the mode of death seem to involve poisoning deaths in general, and secondly the use of the category "Undetermined" introduced in the Eighth Revision of the ICD. It is a common finding in the literature that suicides by poisoning are classified extremely unsystematically, quite often as accidents and particularly frequently as undetermined deaths.

Barracough (1970) has shown that there is considerable variation from one coroner to another in the relative proportion of cases in the open verdict category. Later Barracough (1972) reported also that procedures for classifying unnatural deaths differ between England and Scotland. The rate of undetermined deaths is appreciably higher in Scotland than in England, which suggests that more stringent criteria for suicide may be in use in Scotland, or that available evidence is lacking (Ross & Kreitman 1975). Barracough (1974) studied specifically fatal poisonings with regard to the probability of suicide. He suggested that a limit can be set on the extent of the error in categorizing poisoning deaths (excluding carbon monoxide poisoning) as between suicide and non-suicide. He found the error in the suicide poisoning rate to be less than 50 per cent. Suicides have been suspected to account for a considerably great proportion of the undetermined deaths. Holding & Barracough (1975) reported that if undetermined deaths are for the most part concealed suicides, the error in the official suicide rate as an estimate of incidence may be as much as 22 per cent too low in England. The undetermined death rate was 2.9 per 100,000

population in England.

In his critical book Douglas (1967) emphasized also those changes in statisticizing procedures which, for various reasons, continuously occur in the course of time. In particular, changes of major significance have ensued from the periodic revisions of the International Classification of Diseases categories and coding rules. With the introduction of the Eighth Revision of the ICD, in Finland in 1969, deaths due to self-inflicted injuries were no longer classified as suicides unless the certifier specified intentionality. These changes have produced very clear effects on suicide statistics. For example, Linden & Breed (1976) have presented that with the introduction of the Seventh Revision of the ICD in the U.S.A in 1958, all deaths due to self-inflicted injury were automatically classified as suicides if there was no statement that the injury was accidental or unintentional. This resulted in an overall increase of approximately 3 per cent in the number of deaths classified as suicide. When the Eighth Revision was introduced, in 1968, the change in procedure resulted in a decrease of approximately 6 per cent in the number of deaths attributed to suicide.

The World Health Organization publishes the officially reported suicide rates of many countries from all over the world (WHO 1976). There are great differences in suicide rates between nations. Though it is claimed that such figures are unreliable, the data have been accepted to the extent that they have on occasion been regarded as indices of a country's sociopsychological health (Atkinson et al. 1975).

Brooke & Atkinson (1974) and Atkinson et al. (1975) have published the results of an international study supported by the World Health Organization. In the study, the suicide rates of Denmark and England are compared, and it is shown that there are striking differences in the ascertainment procedures of suicide between the two countries. The Danes consistently reported more suicides than did the English coroners on the same case material. The investigators concluded that considerable doubt is cast on the supposed difference in suicide rates between the two countries. Ross & Kreitman (1975) have criticized the study as non-representative: the samples of cases were small, non-random, and selected, so that it is not possible to gauge how representative they were of the countries from which they were drawn.

In their second study Atkinson et al. (1975) have examined deaths by poisoning for certain coroner districts in England and Wales. It was shown that there is considerable variation from one district to another in the relative proportions of these poisoning deaths which achieve an accident, an open or a suicide verdict. They concluded that coroners differ in their judgment and that different criteria are used in allocating the cases between the three verdicts. This, in turn, means that comparisons between the officially reported suicide rates should be viewed with considerable reservation.

Ross & Kreitman (1975) carried out a study in which national samples

of case records of suicidal-type deaths from England and Wales and from Scotland were reassessed by officials in the other country. It emerged that similar criteria for suicide existed in both countries. The lower official suicide rate among the old in Scotland was therefore considered not to result from ascertainment differences.

Sainsbury & Barraclough (1968) have shown that the rank order of the suicide rate of 11 countries is very similar to the rank order of the suicide rate of first-generation immigrants from the respective countries who lived and died in the U.S.A. and were therefore subject to suicide ascertainment procedures which were different from those in their country of origin. A similar finding for immigrant groups to Australia has been reported by Lester (1972). Barraclough (1973) showed that in the 22 countries using the Eighth Revision of the International Classification of Diseases for their mortality statistics the rank order correlation coefficient between suicide rate and the suicide rate plus the undetermined death rate was very high. This means, according to the investigator, the interdependence of the rank order on the effects of ascertainment procedures and is strong evidence that differences in national official suicide rates truthfully reflect the circumstance that countries actually do differ in their incidence of suicide.

Bagley (1972) concluded from the work of Sainsbury and his colleagues (Sainsbury & Barraclough 1968; Sainsbury 1972) that the reliability of official statistics has been vindicated. Later Bagley (1974) emphasized again that although official statistics almost certainly underestimate the amount of suicidal behaviour, they are nevertheless a useful basis for epidemiological research. This was his response to the criticism presented by Atkinson (1973) who had claimed that research using official suicide statistics is invalid, because of the fact that people categorizing actions as suicidal, prior to the researcher's treatment of those categories as data, use common-sense knowledge about suicide and the researcher's finding must inevitably discover that knowledge.

Atkinson (1975 a) stated that in recent years there has been conducted a considerable amount of research into issues relating to the uses of official statistics for research purposes. It is argued that most of the research has been addressed to the problems of accuracy and reliability of official statistics and that it can be faulted in two main ways. First, it is assumed that there is a "real" suicide rate such that the central issue is the extent to which the rates calculated from the official sources approximate to the supposed "real" rate. From the phenomenological point of view this is based on a seriously mistaken assumption about the way in which social reality in general and suicide in particular are constructed. Secondly, a close analysis of research papers reveals that they do not appear to be adequate to resolve the questions they set themselves. Atkinson suggested that the kinds of assumptions involved in these render such methods of research incapable of achieving their ultimate goal of validating an explanatory theory or theories of suicide, unless a clear distinction

is made between pure and practical theoretical purposes. If this is done, then it may be that such methods and theories are perfectly usable as methods of practical reasoning.

Atkinson (1975 b) maintained that coroners and their officers rely on common-sense theories and take for granted assumptions about why people commit suicide, what kind of persons typically commit suicide, what kind of methods they typically use etc., when they decide whether a death was a suicide, accident or whatever. The theories of suicide are thus built-in features of the definitions of suicide and as such were rediscoverable by suicidologists relying on such pre-processed materials as data.

Maris (1975) has stated that the official statistics are not so much wrong as they are incomplete and that the usefulness of official statistics of suicide is still very much an open question. A researcher uses official statistics because there is no satisfactory alternative. Current needs in the sociology of suicide include that the official statistics of death must be made more reliable and valid.

MATERIAL AND METHODS

Ascertaining and Statisticizing the Cause of Death in Finland

Finnish law obliges the police authorities to investigate all those deaths where the decedent had not been under medical supervision for his last illness or where an accident, violence, poisoning or a suspicion of any of these is directly or indirectly involved. Thus for example, sudden deaths, suspected or certain accidental deaths, suicides, homicides and poisoning deaths fall under police investigation and subsequently usually also under medico-legal examination. Execution of medico-legal autopsy is ordered by the police authority (Isotalo 1961).

After the procedures necessary for the determination of the cause of death have been carried out a physician has to fill up an official death certificate in which the cause of death, key information on the circumstances and the mode of death are entered.

In the study period 1960–61 causes of death were determined in Finland according to the Seventh Revision of ICD. Regarding the mode of death specifically, however, the Finnish directions effective at that time were different from ICD. In addition to the usual modes of death (natural death, accidental death, suicide, homicide), the mode "undetermined" could be used together with the most probable mode of death. Moreover, in totally obscure cases it was possible to use the mode of death "undetermined" exclusively. However, the mode "undetermined" was used very infrequently. So, the official statistics on causes of death listed in those years only the usual modes of death which covered the undetermined deaths as well.

In the latter study period, the years 1970–71, Finland had already introduced the Eighth Revision of ICD, which includes a new mode of death, undetermined death: death due to injury undetermined whether accidentally or purposely inflicted (code numbers E 980–989).

After signing the death certificate the physician mails it to the Registrar of Births and Deaths in the district of the decedent. On the basis of the death certificate the Registrar updates the data in his population register and prepares a notification of death which is sent to the Central Statistical Office of Finland. The Registrar of Births and Deaths sends the death certificate to the Province Chief Medical Officer or to the City Health Officer who checks the information regarding the determination of the cause of death and then forwards the death certificate to the Central Statistical Office. The death certificate undergoes a final check in the Central Statistical Office where it is compared with the notification of death received from the Registrar of Births and Deaths. The Central Statistical Office publishes the official national statistics on causes of death. Corresponding statistics on deaths which have occurred in Helsinki are published by the Statistical Bureau of the City of Helsinki.

Records of medico-legal autopsies and summaries of the records of the police investigations are filed in the respective forensic institutes. Copies of these records are forwarded to the National Board of Health to be filed there. In Helsinki, the medico-legal autopsies are performed in the Department of Forensic Medicine of the University of Helsinki.

Basic Material: Deaths in Helsinki in 1960–61 and 1970–71

The basic material of the present study comprised the data, drawn from the official statistics on causes of death, on the deaths of residents of Helsinki in the years 1960–61 and 1970–71. A person was regarded as a resident of Helsinki if he, at the time of his death, was enrolled by the Registrar of Births and Deaths in the municipal population register of Helsinki. Deaths of residents of Helsinki numbered altogether 8,759 in the years 1960–61 and 10,581 in 1970–71.

The reported number of deaths in Helsinki may be regarded as reflecting the true situation extremely reliably. On the other hand, the statistics may be assumed to be clearly less reliable with regard to the mode of death and the cause of death in particular. One factor exerting a great influence on the reliability of the data is the intensity with which medical and forensic medical examinations have been performed. Table 1 illustrates the procedures employed to determine the causes of death of the persons who died in Helsinki in the years 1960–61 and 1970–71. The rate of autopsies was 50.6 % in the former period and 67.1 % in the latter. The frequency of autopsies, especially in the latter period, may be regarded as considerably high. Moreover, the rate of autopsies has increased remarkably. This increase is statistically highly significant ($p < 0.001$). Cases in which the body of the deceased was not witnessed at all by any physician numbered 27 or 0.3 % in the years 1960–61, but ten years later there were only 3 such cases. Accordingly, from the years 1960–61 to the

Table 1

**Basis for the determination of cause of death in Helsinki
1960–61 and 1970–71**

Procedure	1960–61 all deaths		1970–71 all deaths	
	Number	Per cent	Number	Per cent
Physician has not seen the body	27	0.3	3	0.0
Physician has seen the body	236	2.7	50	0.5
Clinical examination	1 186	13.5	702	6.6
Special examination*	2 797	31.9	2 653	25.1
Medico-legal external examination of body	34	0.4	4	0.0
Medico-legal or medical autopsy	4 435	50.6	7 100	67.1
No information	44	0.5	69	0.7
Total	8 759	100	10 581	100

* i.e., besides the usual clinical examination, some more specific examination, e.g. biopsy or ECG, was performed prior to death

years 1970–71 the methods employed in the determination of the cause of death have grown more intensive in a highly significant degree. As far as determining the mode of death is concerned, the change described above might increase the relative proportion of suicides in the years 1970–71 as compared with 1960–61. On the other hand, it is well to remark here that already in the years 1960–61 in cases where suicide was even suspected a medico-legal autopsy was resorted to almost without exception and this course definitely reduces the assumed increasing effect on the suicide rate of the latter period.

The material of the study was restricted right in the initial stage by excluding all natural deaths from the study and thus confining the study to cover only accidental deaths, suicides, homicides and undetermined deaths. Basing on earlier studies and clinical experience it was estimated that the probability that the category of natural deaths would contain undetected suicides is quite insignificant.

Correspondingly, survey of the homicide cases through scrutinizing the police investigation and autopsy records revealed that there was not a single case among them which would have suggested even a slightest implication of a possible suicide. Therefore, also the group of homicides was excluded from further study. Thus, the proper final study material comprised 833 deaths from the years 1960–61 and 998 deaths from the years 1970–71 (Table 2).

Table 2

**Accidental deaths and suicides in Helsinki
1960-61 and 1970-71
Percentage of all deaths**

Sex	1960-1961			1970-1971		
	Accidents and suicides	All deaths	Percentage of all deaths	Accidents* and suicides	All deaths	Percentage of all deaths
Males	541	4 140	13.1	665	5 211	12.8
Females	292	4 619	6.3	333	5 370	6.2
Total	833	8 759	9.5	998	10 581	9.4

* including 65 undetermined deaths, 45 males and 20 females

The cases under study account for 9.5 % and 9.4 % respectively of all the deaths in the two-year periods concerned. Men are highly significantly over-represented as compared with women. While men accounted for 47.3 % and 49.2 % in the basic material, their corresponding proportions in the study materials were 65.7 % and 66.6 % respectively.

Table 3

**Accidental deaths and suicides by sex in Helsinki
1960-61 and 1970-71**

Mode of death	1960-1961			1970-1971		
	Males	Females	Total	Males	Females	Total
Accidents*	370	190	560	496	242	738
Suicides	171	102	273	169	91	260

* including 65 undetermined deaths, 45 males and 20 females, in 1970-71.

Table 3 illustrates the distribution of the total study material by sex and the mode of death. Accidental deaths of men are clearly the largest group while suicides by women comprise the smallest group. The frequencies of the deaths under study by sex and the mode of death are presented individually for the years 1960, 1961, 1970 and 1971 in Table 4, with a comparison with

Table 4**Accidents and suicides, by sex, per 100,000 inhabitants in Helsinki
in the years 1960, 1961, 1970 and 1971**

	1960	1961	1970	1971
Accidents* :				
Males	96	89	101	110
Females	31	44	40	42
All accidents	59	64	67	72
Suicides:				
Males	42	44	36	35
Females	21	19	18	15
All suicides	31	30	25	24
All deaths:				
Males	1039	1038	1075	1137
Females	896	917	905	916
All deaths	958	970	980	1014

* including undetermined deaths in 1970 and 1971

the corresponding frequencies of all deaths in the respective years. The table illustrates that the relative proportion of accidental deaths has grown from year to year, that of suicides again has decreased while the frequency of all deaths has been increasing.

Thus, in the light of official statistics on the causes of death it appears that the suicide rate has definitely decreased from the years 1960–61 as compared with the years 1970–71. It remains open to question whether this decrease in the suicide rate is a "real" one, or whether the diminution can be explained by e.g. factors involved in the statisticizing procedures.

Rating the Degree of Certainty of Suicide

The present author received from the Central Statistical Office copies of the death certificates of all the cases belonging to the proper study material. The author had the data on the police investigations as well as on the medico-legal autopsies and the forensic medical special examinations performed in connection with the autopsies. The majority of these data were obtained from the autopsy records in the Department of Forensic Medicine of the University

of Helsinki and from the files at the National Board of Health. The information collected in this way was supplemented, in a way described in subsequent text, in those cases where the determination of the mode of death proved difficult.

In the very first stage, in order to create an overall impression of the material under study, the author looked through all the deaths as assorted according to the underlying cause of death, surveying first the suicides and after that the undetermined deaths and fatal accidents as a combined group.

In the second stage all those deaths were separated from the material which were assessed as certain accidents. In this stage of the study, a death was evaluated to be a certain accident on the ground that all the available information had created a clear view that the victim could not have had any intentional connection whatsoever with the incident. Typical examples of deaths belonging to this group would include e.g. crash-landing of an airplane resulting in the death of its passengers, more generally the death of a passenger of a vehicle in a traffic accident, or as a further example, an elderly person who falls on a level road, suffers a fracture of the femur and succumbs.

In the third stage those cases were set apart from the material which seemed to be outright certain suicides. A clearly and definitely expressed intention to die as well as a purposefully planned and accomplished self-annihilation served as the criterion of a certain suicide. A typical example is illustrated in the following case. A man had written a farewell letter in which he stated clearly his intention to die and gave instructions about arrangements to be made after his death. He had locked himself up in his apartment, caulked the kitchen door very tightly so as not to leak any, made certain that the token-operated gas range would not run out of gas, opened up all gas jets and remained lying on the mattress which he had brought into the kitchen, waiting for death to come.

In the fourth stage probable accidents were set apart from the material. The author regarded as probable accidents such deaths which did not involve anything suggesting suicide but in which the mechanism of the accident was of the kind that figuring theoretically the incident might in some individual sporadic cases have implied a suicide as well. A typical example of a death belonging to this group would be a man, severely intoxicated with alcohol who collapsed on the street, or an alcoholic who was drinking in a boozier gang on docks and plunged over into the sea.

In the fifth stage the author dealt with all the remaining cases and those cases which already had been evaluated as certain suicides. Efforts were made to acquire all official information on the illnesses and social performance of the decedents in these groups, relating both to the time of the suicide or death and to earlier history. The initial acquisition of these data covered the information on the decedent's illnesses obtained from the relatives by the police when they were investigating the death, signs of diseases revealed in the autopsy, and finally the relevant information discovered in the decedent's income tax returns

of the last three years: deductions of expenses due to illnesses and statements about health. If these data indicated hospital or out-patient department treatments or examinations, relevant records were obtained. Furthermore, for each decedent in this group the author checked systematically if any of them had had a treatment contact in any psychiatric hospital in greater Helsinki area. In individual obscure cases persons who had attended to the decedent were interviewed in order to solve the probability of suicide. Thus, for each decedent in this group a psychodynamic exploration of the case study type was performed in order to evaluate the suicidal intention. Relatives were not interviewed retrospectively, since the procedure described above was considered sufficient. Moreover, the principle was to keep to the facts which had been recorded prior to the suicide and which consequently could not have been influenced by the incident, suicide, itself. It is also well to remark that since the study deals with a comparison of two periods the interval of which is as long as ten years, interviewing relatives could not be thought of.

In the sixth stage a new group was composed beside that of certain suicides, the group of "almost certain suicides". This group was made to include those deaths which, considering the general state of affairs, clearly appeared to be suicides, but in which it was not possible to discern an overt intention to die as expressed by the decedent. However, the situation provided some circumstantial evidence of such an intention. A typical example would be a person who earlier in his life has in various ways, like attempting suicide, expressed his propensity to suicide and who subsequently is found dead. Blood analysis reveals a high concentration of barbiturates, or on the bedside table there was an empty bottle of hypnotics with 20 to 30 tablets missing.

In the seventh stage the author re-examined all those cases which had remained undetermined and endeavoured once again to classify them. If it proved necessary, additional new information was requested and obtained from hospitals, infirmaries and the like where some of them possibly had been treated prior to their death. In most cases, however, the issue was not a lack of information but rather the fact that the incidents and circumstances were of quite an obscure nature and even for the decedent most likely contradictory and confusing. In such situations evaluation of intention after the death with adequate certainty is by no means possible.

Thereafter, in the eighth stage the author compiled an ultimate rating scale for the classification of the certainty of suicide. It was now endeavoured to define operationally the categories described above, the aim being a final classification. The rating scale is presented as a separate scheme on the next page. This rating scale was applied in the final categorization of all the deaths in the material. In the last final stage, acting in accordance with this rating scale led to decisions that some borderline cases were reassigned from one category to another. It was considered to be of utmost importance to look all the deaths over one more time with relation to the rating scale, since it

might have been possible that during the prolonged term of the study the evaluation procedure would, in the course of time, have undergone variation which would have introduced systematic error in the results.

Rating scale for determining the degree of certainty of suicide

Certain suicide (0):

Certain suicide refers to a willful, self-inflicted, life-threatening act which has resulted in death and in which intent to end life has been high.

Almost certain suicide (1):

Almost certain suicide refers to a willful, self-inflicted, life-threatening act which has resulted in death and in which intent to end life has been medium or high, but intent is judged mainly from circumstantial evidence.

Undetermined, suicide possible (2):

Death classified as undetermined, suicide possible, refers to an event which has resulted in death in such circumstances that a willful, self-inflicted, life-threatening act is probable but the evidence of intent to end life is inconclusive.

Almost certain accident (3):

Almost certain accident refers to an event which has resulted in death likely unintentionally but in such circumstances that a willful, self-inflicted, life-threatening act is also possible though not likely.

Certain accident (4):

Certain accident refers to an untoward event which has resulted in death unintentionally.

Statistical Treatment and Presentation of the Results

In the present study fatal accident and suicide rates refer, according to internationally well-established usage, to the number of the phenomena under study in the population per year and 100,000 population. Accordingly, e.g. suicide rate is obtained by the formula: the number of suicides divided by the population and multiplied by 100,000. If the survey covers more years than one, the obtained figure must be divided further by the number of the years in order to attain the proper annual rate.

When rates are presented in the further text repeated references to the method of calculation are not made but the rates are indicated simply as their absolute values.

When judging rates one must bear in mind that when the numerator in the above formula (i.e. the number of suicides) is numerally small, even minor changes in the numerator result in considerable percental changes in the rates. Regarding the use of age-adjusted rates there is the restriction that age-adjusted rates are comparable only with similarly adjusted rates.

The population bases of the present study comprise the data on censuses carried out in Helsinki on Dec. 31, 1960 and Dec. 31, 1970. The population of Helsinki was 452,777 on the former date and 510,353 on the latter. The points of time at which the censuses were conducted fall as profile estimates right in the middle of the respective two-year periods under study. As for the mean population, there was an increase of 2.0 % from the year 1960 to 1961 and correspondingly a decrease of 0.2 % from the year 1970 to 1971. Accordingly, there have occurred fairly slight changes in the population of Helsinki.

In Helsinki, the population indicated by the census has always been somewhat lower than the population enrolled in the municipal population register by the Registrar of Births and Deaths. This fact gives rise to a minor source of error with regard to suicide rates, more particularly when comparisons are made between the periods 1960–61 and 1970–71. In the case of the death certificates the fact is namely that being enrolled in the municipal population register of Helsinki serves as the criterion of being a resident of Helsinki. Consequently, the observations regarding deaths (fatal accidents and suicides) have actually been drawn from a larger population group than the one indicated by the census returns. As far as the formula for calculating the rates is concerned, the differences in the population figures purport that the denominator is now slightly smaller. This again leads to the consequence that the rates become slightly too high. Moreover, attention must be paid to the fact that in the years 1970–71 the difference between the mean population in the municipal register and the population based on census was distinctly greater than in the years 1960–61. The mean population enrolled in the municipal register was in 1971 3.8 % and in 1970 4.0 % greater than the population indicated by the census of 1970. The corresponding differences in the years 1961 and 1960

were + 1.3 % and - 0.7% respectively. For the years 1960-61 the difference described above causes in the suicide rate an increase of only 0.1 or 0.3 %. For the years 1970-71 again, the method of calculation enhances the suicide rate as much as 1.0 or 3.9 %. This signifies that while the suicide rate of 30.1 in 1960-61 had diminished to 25.5 in 1970-71, the observed decrease in the suicide rate grows still greater when the mean population is employed as the basis for calculation, that is to say from 30.1 in 1960-61 to 24.5 in 1970-71. In the former case the decrease is 15.5 %, in the latter case the decrease would grow as high as 18.5 %. The small error due to the method of calculation must be taken into consideration when the results are being interpreted.

The overwhelming part of the phenomena under study, especially suicides, are unevenly distributed among the population as far as age is concerned. E.g. suicides occur almost exclusively among the population over 14 years of age. Likewise, in different kinds of fatal accidents the age distributions vary greatly. Nevertheless, since the phenomena under study are not, after all, confined merely to the adult population, the rates have, for the most part, been calculated in relation to the total population. Age-adjusted rates have not been calculated unless that has been mentioned specifically. When rates calculated in relation to the total population are interpreted it must be born in mind that in the years 1960-61 the proportion of 0-14-year-old children of the total population was 100,414 or 22.4 % while in the years 1970-71 the corresponding proportion was 99,137 or 19.4 %. The decreased relative proportion of children in the latter study period produces, due to the method of calculation, a slight apparent increase in the suicide rate of adults, as compared with the years 1960-61. While the decrease in the suicide rate for the total population was 15.5 % from the years 1960-61 to the years 1970-71, the corresponding decrease for the population over 14 years of age was 19.0 %. Thus, the change in the age distribution of the total population does not lessen the decrease in the suicide rate which is under our scrutiny, but on the contrary contributes a slight further increase to it.

RESULTS

Fatal Accidents

This part of the study comprised 554 fatal accidents which have occurred in the years 1960–61 and correspondingly 673 fatal accidents from the years 1970–71. Table 5 illustrates the distribution of these accidents by certainty of suicide into the categories which have been defined previously in the chapter "Material and Methods". The absolute number of fatal accidents has grown clearly higher (21.5 %). Also the fatal accident rate has increased, although not in such a great degree that the difference would reach statistical significance. In the former period the accident rate was 61.2 and in the latter one 65.9 per year and 100,000 population.

A finding of cardinal importance is that in both periods cases evaluated as certain or almost certain accidents accounted for clearly over 90 % of all fatal accidents. The proportion of estimated certain accidents was 78.7 % in the years 1960–61 and 83.2 % in 1970–71, and for almost certain accidents the corresponding figures were 15.9 % and 13.7 % respectively.

The number of accidents evaluated as certain accidents was definitely higher in the latter period than ten years earlier. Likewise, the increase in their rate from 48.1 to 54.9 is a plain trend, but still does not yet reach statistical significance. Testing statistical significance in this connection is, however, a relative measure, since here it is not a sample which is being dealt with but a whole, total phenomenon in which all the discovered changes are "real". This same observation bears also upon the evaluation of all the results presented in subsequent text.

Table 5

Accidental deaths in Helsinki, 1960–61 and 1970–71
Certainty of suicide

Certainty of suicide	1960–61 N = 554		1970–71 N = 673	
	Per cent	Rate per 100,000	Per cent	Rate per 100,000
Certain suicide	0.5	0.3	—	—
Almost certain suicide	1.1	0.7	0.1	0.1
Undetermined, suicide possible	3.8	2.3	3.0	2.0
Almost certain accident	15.9	9.7	13.7	9.0
Certain accident	78.7	48.1	83.2	54.9
Total	100.0	61.2	100.0	65.9

The absolute number of almost certain accidents, i.e. accidents which were appraised to involve at least a theoretical risk of suicide, has remained roughly unchanged. Instead, their percental proportion of all fatal accidents has diminished slightly, from 15.9 % down to 13.7 %. The rate of almost certain accidents has decreased correspondingly from 9.7 to 9.0. Statistically this change is not significant.

To the category "undetermined, suicide possible", have been assigned fatal accidents wherein the possibility of suicide is considerable, but the individual's intention to end his life is for various reasons so insufficiently demonstrable so as to warrant to classify the case as suicide. It was evaluated that of all fatal accidents in the years 1960–61 a total of 3.8 % belonged to this group and 3.0 % of those fatal accidents which occurred in 1970–71 while the corresponding rates were 2.3 and 2.0 respectively. Thus, even in this group the likelihood of suicide is slightly lower in the years 1970–71 as compared with the years 1960–61. However, the difference is not statistically significant.

Of all the 554 accidents which occurred in the years 1960–61 the evaluation was almost certain suicide in only six cases or in 1.1 % and certain suicide in three cases or in 0.5 %. The corresponding rates were 0.7 and 0.3 respectively. Ten years later, in 1970–71, of the 673 fatal accidents only three cases or 0.1 % were appraised as almost certain suicides. In the latter period there was not a single case which would have been evaluated as a certain suicide. Accordingly, of all the fatal accidents the evaluation result was almost certain or certain suicides put together in 1.6 % in the years 1960–61 and in only 0.1 % in the years 1970–71. The influence on the suicide rate in the former period is 1.6

and only 0.1 in the latter which would correspond to an increase of 5.3 % and 0.4 %, respectively, in the official suicide rate.

The results presented above seem to demonstrate that the deaths classified officially as accidents included cases which in the present study were evaluated as probable or certain suicides definitely more often in the years 1960–61 than in 1970–71. On the other hand, special attention must be called to the fact that the fatal accidents actually evaluated as suicides were in fact amazingly few in number as compared with findings presented earlier in the literature (confer e.g. McCarthy & Walsh 1966, 1975). As for the years 1970–71, the official figures on fatal accidents must be considered very reliable with regard to suicides.

In the case of the years 1960–61 it is proper to bring up for consideration that three cases which in the present study were evaluated as almost certain suicides and similarly the three deaths evaluated as certain suicides had in the original death certificates indeed been classified as suicides, even though the Central Statistical Office had subsequently, for one reason or other (technical error?) filed them as accidental deaths. Consequently, the difference concerning the likelihood of suicide between the judgments by the physicians who drew up the death certificates and the evaluations by the present author grows distinctly smaller still. In this latter instance, the influence on the suicide rate would be 0.3 in the years 1960–61 and 0.1 in 1970–71. Correspondingly, the percental proportion of all fatal accidents constituted 0.5 % and 0.1 % respectively.

Looking at Table 5 and surveying as a whole the change in the certainty of suicide among fatal accidents which has occurred between the years 1960–61 and 1970–71, a definite course of development is noticed. In the case of all the groups it is seen that the likelihood of suicides has diminished. Yet, almost one fifth of the fatal accidents still carry such features that they have been evaluated to involve a possibility of suicide in a variable degree.

Finally, for the sake of clarity, prominence has to be given to the fact that the concept of certain accident implies in this connection that on the part of the victim the accident did not involve any intentional aspiration for death. It is obvious, of course, that deaths classified as certain deaths often embrace various psychological factors which have intensified the victim's accident-proneness.

Accidental fatal poisoning

Considering various fatal accidents the possibility of suicide seemed to pertain most clearly to fatal accidental poisonings (Table 6 A and B). Poisonings accounted for most of those fatal accidents which in the present study were classified as certain suicides, almost certain suicides or were evaluated to belong to the group "undetermined, suicide possible". On the other hand, only a few

Table 6A

Accidental fatal poisonings in Helsinki, 1960–61 and 1970–71.

Certainty of suicide

Certainty of suicide	Poisonings in 1960–61 (N = 99)		Poisonings in 1970–71 (N = 97)	
	Per cent	Rate per 100,000	Per cent	Rate per 100,000
Certain suicide	3.0	0.3	—	—
Almost certain suicide	5.1	0.6	—	—
Undetermined, suicide possible	15.2	1.7	15.5	1.5
Almost certain accident	65.7	7.2	58.8	5.6
Certain accident	11.1	1.2	25.8	2.4
Total	100.0	10.9	100.0	9.5

Table 6 B

Proportion of poisonings in all officially accidental deaths
by certainty of suicide

Certainty of suicide	Officially accidental deaths	
	1960–61 (N = 554)	1970–71 (N = 673)
	Proportion of poisonings (%)	Proportion of poisonings (%)
Certain suicide	100	—
Almost certain suicide	86	—
Undetermined, suicide possible	74	75
Almost certain accident	74	62
Certain accident	2	4
Total	18	14

sporadic fatal poisonings were evaluated as certain accidents.

In the years 1960–61 there occurred a total of 99 fatal accidental poisonings, and in 1970–71 they amounted to 97 cases. Correspondingly, the rates of accidental poisonings were 10.9 and 9.5 respectively. The small decrease in the accidental poisoning rate seems to be explained almost entirely

by the fact that in the years 1970–71 there were not at all such accidental poisonings which in the 1960–61 series had been evaluated to be suicides.

When the two study periods are compared with each other, it will be discerned that in the former period the probability of suicide in accidental fatal poisonings has been definitely higher. In the years 1970–71 accidental poisonings tend more clearly toward accidents. Of the accidental fatal poisonings, the cases evaluated as almost certain or certain poisoning accidents accounted together for 77 % in the years 1960–61 and for 84 % in 1970–71. The majority of the fatal accidental poisonings have been evaluated as almost certain accidents. This group comprised 66 % in the years 1960–61 and 59 % in 1970–71. The overwhelming number of these were alcohol poisonings which accounted for 91 % and 75 % respectively of all the cases in the category of almost certainly accidental poisonings.

Tables 7 and 8 represent more detailed surveys of fatal alcohol poisonings. There occurred in Helsinki fatal accidental alcohol poisonings a total of 59 cases in the years 1960–61 and 58 cases in 1970–71. The corresponding rates of fatal alcohol poisonings were 6.5 and 5.7 in respective periods. The figures include only poisonings solely by alcohol. Deaths by combinations of drugs and alcohol are not included in these figures. The rates illustrating fatal alcohol poisonings must be regarded as extremely high. They account for 60 % of all fatal accidental poisonings in both study periods.

For the sake of comparison it may be mentioned that in whole Finland alcohol poisoning mortality was 4.8 in the years 1967–71, and in the Province of Uusimaa, in which Helsinki is the capital, the corresponding rate in the same years was 5.5 per year and 100,000 population. In that five-year period alcohol poisonings accounted for 69 % of all accidental fatal poisonings in Finland (Poikolainen 1977).

The majority of the victims of accidental deaths by alcohol are men. The proportion of men was 85 % in the years 1960–61 and 91 % in 1970–71 while the corresponding rates were 5.5 and 5.2 respectively. In the case of women deaths by alcohol poisoning are 5 to 10 times less frequent. Most com-

Table 7

**Fatal alcohol poisonings in Helsinki, 1960–61 and 1970–71
per 100,000 inhabitants**

	1960–61	1970–71
All fatal alcohol poisonings	6.5	5.7
Males	5.5	5.2
Females	1.0	0.5

Table 8

**Fatal alcohol poisonings in Helsinki, 1960–61 and 1970–71
by sex and age**

	1960–61, 1970–71, N = 59, N = 58, Per cent Per cent	
Males	84.7	91.4
Females	15.3	8.6
Age, 15–34	10.2	5.2
Age, 35–49	44.1	58.6
Age, 50–64	40.7	34.5
Age, 65–80	5.1	1.7

only a fatal alcohol poisoning involved a middle-aged man who had been afflicted with chronic alcohol problems. There were only a few sporadic cases in which the death was associated with temporary use of alcohol.

A further characteristic of the group of fatal alcohol poisonings is that the proportion of alcoholics on the skid-row level was remarkably high: 37 % in the years 1960–61 and 40 % in 1970–71. With the exception of one woman, all of them were men. One might presume that such a high figure would be explained by a trend that the most derelict alcoholics would drift down to Helsinki, the capital of Finland. However, Poikolainen (1977) has established in his study on alcohol poisonings which covers the whole country that the proportion of skid-row alcoholics is of the same order, viz. 38 %.

The alcohol poisoning was in about one quarter of the cases due to denatured alcohols. Denatured alcohols accounted for 27 % of the fatal accidental alcohol poisonings in 1960–61 and for 22 % in the years 1970–71. The corresponding rates, 1.8 and 1.3 indicate that such poisonings have diminished in some degree.

It has often been stated in the literature that alcohol and suicides are intertwined with each other in various ways (WHO 1968, Lönnqvist & Aché 1971, Virkkunen 1971), but that on the other hand suicides committed with solely alcohol are extremely rare cases (Harenko 1967, Poikolainen 1977). In the present study, all the deaths from alcohol poisoning in the years 1960–61 were evaluated as almost certain accidents. As for the fatal alcohol poisonings in the years 1970–71, the evaluation was "undetermined, suicide possible" in 4 %, almost certain accident in 90 % and certain accident in 6 %. Thus, among the alcohol poisonings there were no probable or certain suicides at all in either study period.

It has been assumed quite generally that apparently in some countries there are concealed among fatal accidental poisonings such deaths which in some other country would have been classified as suicides (confer e.g. Brooke & Atkinson 1974). Barraclough (1974), for instance, concluded that in England and Wales the error in the suicide rate by poisoning must be less than 50 per cent and the contribution to the error in the suicide rate from all causes, less than 23 per cent. In an international study conducted under the direction of WHO the suicide rates, poisoning mortality and frequency of undetermined deaths in several European countries were compared. In that study attention was paid to the high fatal poisoning rates in Finland and to the increase in the rates which has occurred from the beginning of the 1960s toward the end of that decade (Brooke & Atkinson 1974). It is stated in the WHO study report that it seems unlikely that in 1965 for every 15 men who purposely took their lives in Finland, another 4 should have accidentally poisoned themselves. If, however, as has been contended, most accidental poisonings are in fact suicides, this would raise the Finnish rates in 1969 by 48 % for males and by 20 % for females.

In the present study it was evaluated that of all the fatal accidental poisonings which occurred in the years 1960–61 a total of 8 % were almost certain suicides. In the years 1970–71 there were no such accidental poisonings which would have been evaluated as suicides. Thus, although the number of fatal accidental poisonings is high, quite few of them would appear to be suicides. As it was stated earlier, the most significant factor contributing to the highness of the mortality from accidental poisonings is the rate of fatal alcohol poisonings which does not appear to involve suicides at all.

Even though deaths from alcohol poisoning do not seem to cover up suicides, as phenomena they nevertheless appear to be linked indirectly with each other. Chronic alcohol problem has often been called a slow suicide. The results of the present study indicate how deaths from alcohol poisoning are associated expressly with chronic abuse of alcohol and how there are strong connections with e.g. alcoholism of skid-row level and use of denatured spirits. Deaths from alcohol poisoning may indeed be well regarded as a special case of a more extensive phenomenon of self-destruction. This phenomenon manifests itself as direct and indirect self-destruction in most diversified forms. Suicides constitute one small part of this phenomenon. If self-destruction is viewed as a broad concept, then particularly in Finland attention must be paid also to fatal alcohol poisonings, which, after all, constitute in Helsinki so large a group that they equal to one fifth of all suicides committed in Helsinki.

Other fatal accidents

Regarding various types of accidents, next to accidental poisonings, the possibility of suicide seemed to be connected with drownings (Table 9). There occurred accidental drownings in Helsinki a total of 73 cases in the years 1960–61 and 84 cases in 1970–71. The study material of the period 1960–61 does not include those 6 cases of drowning in which the decedent had actually got drowned in 1959 but the body was found after the turn of the year. These 6 cases are, however, included in the official mortality statistics of 1960; hence the difference in the total of accidental deaths in 1960–61 between Tables 3 and 5. As for the study period 1970–71, there were no corresponding cases. The rates of accidental drownings were 8.1 and 8.2 respectively. Although there is a slight increase in the absolute number of drowning cases, these incidents have nevertheless remained equally common.

Table 9

Accidental drownings in Helsinki, 1960–61 and 1970–71
Certainty of suicide

Certainty of suicide	1960–61 N = 73		1970–71 N = 84	
	Per cent	Rate per 100,000	Per cent	Rate per 100,000
Certain suicide	—	—	—	—
Almost certain suicide	—	—	1.2	0.1
Undetermined, suicide possible	5.5	0.4	4.8	0.4
Almost certain accident	19.2	1.5	17.9	1.5
Certain accident	75.3	6.1	76.2	6.3
Total	100.0	8.1	100.0	8.2

Three quarters of the drownings were evaluated as certain accidents. On the other hand, almost certain accidents, which still might in some cases involve even a possibility of suicide, accounted for 19 % in the years 1960–61 and for 18 % in 1970–71. The figures correspond to a rate of 1.5 in both study periods. Likewise, the frequency of drowning accidents evaluated as undetermined had remained unchanged or 5.5 % and 4.8 % respectively of all accidental drownings, which correspond to a rate of 0.4 drownings per year

and 100,000 population. There were no probable suicides in the years 1960–61 and only one probable suicide in the years 1970–71. The overall impression about accidental drownings is very similar in both study periods.

In the case of other accidents than poisonings and drownings the probability of suicide was evaluated to be extremely small (Table 10). Apart from poisonings and drownings there occurred in the years 1960–61 a total of 386 accidents of other kind, 97 % of which were evaluated as certain accidents. Similarly, of the 492 fatal accidents which occurred in the years 1970–71, a total of 96 % were evaluated as certain accidents. The corresponding accident rates are 40.9 and 46.1 respectively. It was evaluated that almost certain accidents accounted for 2.4 % and 4.1 %, the corresponding rates being 1.0 and 2.0 respectively. The frequency of almost certain accidents is distinctly higher in the latter period. Almost certain accidents involve mainly some falling cases and traffic accidents in which there were no direct suggestions about suicide but where the mechanism of the accident was of such kind that at least theoretically the deaths could have been intentional.

Undetermined accidents, in which the possibility of suicide has been evaluated to be clearly greater, numbered two in the years 1960–61 and in 1970–71 there was only one single case. Two of these were incidents in which the decedent had been run over by a train and one case involved falling from a high place.

Table 10

**Fatal accidents other than poisonings and drownings in Helsinki
1960–61 and 1970–71
Certainty of suicide**

Certainty of suicide	1960–61 N = 382		1970–71 N = 492	
	Per cent	Rate per 100,000	Per cent	Rate per 100,000
Certain suicide	—	—	—	—
Almost certain suicide	0.3	0.1	—	—
Undetermined, suicide possible	0.5	0.2	0.2	0.1
Almost certain accident	2.4	1.0	4.1	2.0
Certain accident	96.9	40.9	95.7	46.1
Total	100.0	42.2	100.0	48.2

As for probable suicides, there was only one case, in the study period 1960–61. Moreover, in the original death certificate this death had been classified as a suicide, but the Central Statistical Office had recorded it, for one reason or other, as an accident. There were no other cases which would have been evaluated as suicides.

In the literature the opinion has very often been presented that quite many accidents are actually disguised suicides. Even a new term has been coined, "a hidden suicide" (Meerloo 1968). Such an opinion has received support from individual clinical observations which have been described in the literature. Particular attention has been paid to the circumstance that among car accidents there might be suicides, especially so when a one-car accident is involved. This belief has been supported also by the discovery which has been made in several studies that accident-prone persons have had remarkably abundantly aggression problems (Conger & Gaskill 1967) as well as a lot of alcohol problems (Selzer et al. 1964). Similarly, many studies have indicated suggestions to the effect that proneness to traffic accidents is correlated with self-destructive tendencies (Näätänen 1972). As a setoff against all this it must be stated that there is no definite research evidence to demonstrate that there are suicides hidden away in traffic accidents. The first serious study of this problem was conducted by Tabachnick et al. (1973) in Los Angeles. This work provides convincing evidence for the conclusion that suicidal and self-destructive factors do not play a significant role in the occurrence of most one-car accidents.

The present study did not include one single automobile accident in which so many suggestions about suicidal intention could be detected that the accident would have been evaluated as a suicide or even as an undetermined death.

In 1969 there occurred 177 such road accidents which were examined by a special investigating committee, and in one case of these the main cause was evaluated to be a suicide (Näätänen 1972).

Undetermined Deaths

The mode of death called Undetermined death was introduced in Finland when the Eighth Revision of ICD came into effect in the beginning of 1969. Therefore, in the present study undetermined deaths are surveyed only in relation to the latter study period, the years 1970–71.

In the years 1970–71 a total of 65 deaths in Helsinki had been classified officially as undetermined deaths. Table 11 illustrates the distribution of these cases by the probability of suicide.

Altogether 29 cases or 45 % were evaluated as certain or almost certain accidents. With regard to suicide, 21 cases or 32 % remained unsettled. A probable suicide was involved in 13 cases (20 %), while 2 deaths (3 %) were

Table 11

Undetermined deaths in Helsinki, 1970–71
Certainty of suicide

Certainty of suicide	All undetermined deaths, N = 65		Undetermined poisonings N = 20	Undetermined drownings N = 20
	Per cent	Rate per 100,000	Rate per 100,000	Rate per 100,000
Certain suicide	3.1	0.2	0.2	—
Almost certain suicide	20.0	1.3	1.0	0.2
Undetermined, suicide possible	32.3	2.1	0.8	0.9
Almost certain accident	20.0	1.3	—	0.8
Certain accident	24.6	1.6	—	0.1
Total	100.0	6.4	2.0	2.0

evaluated as certain suicides. Accordingly, the undetermined deaths were distributed among all five categories, tending, however, slightly more toward accidents than suicides.

All in all, the rate of the deaths officially classified as undetermined deaths was 6.4 in Helsinki in the years 1970–71. In the present study it was evaluated that of that official undetermined death rate, suicides accounted for 1.5, accidents for 2.9, while 2.1 remained as the undetermined death rate.

Almost all (93 %) deaths evaluated as certain or almost certain suicides and also an overwhelming majority (86 %) of deaths evaluated as undetermined were fatal poisonings or drownings. Moreover, drownings also accounted for a significant proportion (62 %) in almost certain accidents. On the other hand, almost all (94 %) deaths evaluated as certain accidents were other deaths than poisonings or drownings.

It has been claimed (Barraclough 1972, 1973) that the majority of undetermined deaths would be suicides, at least in some countries, and that there occurs great variation in the application of the undetermined mode of death. Therefore, undetermined deaths are surveyed in a somewhat greater detail in the subsequent text.

Among the official undetermined deaths there were 16 cases or 25 %

which were evaluated as certain accidents on the basis of the nature of the death event or mechanism. Of these, 13 cases involved a brain injury which had been suffered by an alcoholic, an elderly person or an epileptic under obscure circumstances in which the possibility of suicide could not, however, be thought of. Two other cases were victims of a homicide, which fact was discovered only after the death certificate had already been written. One decedent had got drowned accidentally. A common feature in all these deaths was insufficiency of the information on the incident itself. Most brain injuries were accompanied by subdural hemorrhage, and they befell persons who form a definite risk group with regard to skull injuries.

Almost certain accidents were evaluated to account for 13 deaths or 32 %. The largest group here was composed of drownings which numbered eight. Four of the drowning cases involved skid-row alcoholics who had fallen into the sea and further two decedents were heavily intoxicated when they got drowned. Characteristics of this whole category include risk taking behaviour, alcohol as a contributory factor and death under circumstances in which a suicide might be hidden in somebody's case.

The category "undetermined, suicide possible" was evaluated to include 21 deaths or 32 %. Of these, 18 cases were drownings and poisonings. The largest group consisted of ten drownings under obscure circumstances. Four of the drowned persons were chronic alcoholics, another four again were depressive, suicidal psychiatric patients. There were eight poisonings in this category, all of them involving a poisoning with psychopharmacological agents. In six cases the drug poisoning was associated with such chronic drug abuse where assessing the intention at the time of the actual situation resulting in death proved difficult. In addition to drownings and poisonings, this category came to include three other deaths evaluated as undetermined: two decedents had fallen from a high place under obscure circumstances and one case was a skid-row alcoholic who had been run over by a train.

The 21 deaths which were described above and have been evaluated as belonging to the category "undetermined, suicide possible" were, moreover, reclassified according to the prospect whether they were more probably accidents or suicides. Thus, if there existed no undetermined mode of death, of these 21 cases 11 deaths or one half would be more probably suicides than accidents. This postulated suicide group would then include five women and six men. If these cases were included in the official suicide figures, they would grow by 4.0 % and the suicide rate would increase by 1.1. However, in the present study this whole group was still left as undetermined deaths and excluded from the suicide group. This whole category of 21 undetermined deaths is characterized by the facts that classifying the cases as either accidents or suicides is difficult because the information on the circumstances at the time of death is insufficient and, on the other hand, because the very incident involves inconsistencies.

Indeed, it is quite evident that there will always be such deaths that classifying them as accidents or suicides will be most difficult, however good the information regarding the incident might be. This is due to the fact that even for the individual himself the very incident, dying, is conflicting and imperfectly recognized as an intrinsic event.

Of the deaths officially classified as undetermined, the present author evaluated 13 cases or 20 % as almost certain suicides and 2 cases or 3 % as certain suicides. As for the manner of death, among the 15 cases evaluated as suicides there were 12 poisonings, 2 drownings and 1 decedent jumped from a high place. In nine poisonings psychotropic drugs were employed; of these cases, six decedents had ingested several types of drugs and the remaining three decedents had taken only one brand of a drug but in very copious amounts. Two decedents had expressed their intention to die in such an obvious manner that these cases were evaluated as certain suicides. As for the other cases, the intention was inferred indirectly from the individual's history and the details associated with the actual incident. All together, the official undetermined deaths evaluated in the present study as suicides raise the official suicide figures by 5.8 % and increase the suicide rate by 1.5. This influence has to be appraised as rather slight as compared with the view presented in the literature (Barraclough 1973) that all undetermined deaths should be added to the suicide rate in order to achieve a reliable understanding about the frequency of suicides.

Discrimination between undetermined deaths and suicides has always been a critical issue in the case of fatal poisonings, especially deaths from drug poisoning. The results of the present study demonstrate that a great proportion of deaths which forensic medical examinations have classified as undetermined deaths have in the present study been evaluated as almost certain or certain suicides. In many cases the physician who issued the death certificate has been inclined to emphasize the possibility of an accident, and more specifically, that the case involved so-called "drug automatism".

Barraclough (1974) has paid attention to the fact that suicides by poisoning and fatal poisonings classified as accidental or undetermined do not differ from each other in any appreciable degree, as far as the types of the employed drugs are concerned. Consequently he requests how is it possible that accidental fatal poisonings involve psychopharmacological drugs, which is definitely in contrast with the distribution of drugs generally found in regular homes; and secondly, how is it possible to ingest fatal amounts of several brands of drugs. Fatal drug poisonings involve most often ingestion of multiple types of medicines.

The concept of drug automatism was first introduced by Richards (1934). He described three patients who took several hypnotic tablets and fell asleep but after waking up did not remember having taken too many pills. Subsequently many other authors have utilized the concept of drug automatism to explain intoxications. Among others, Jansson (1962) has suggested that one

quarter of attempted suicides with drugs would in fact involve drug automatism. Jansson (1961) has further claimed that persons who died as a result of drug automatism distort suicide statistics. A central issue in the concept of drug automatism is the belief that after taking a therapeutic dose of his drug the individual loses his memory and then inadvertently takes new pills several times reaching finally a lethal dose.

Long (1959) was the first one to pay attention to the fact that the whole concept of drug automatism was based only on the three case histories presented by Richards a long time ago, and that his report did not even involve research results but interpretation. Subsequently Dorpat (1974) has emphasized that the literature contains no well-authenticated cases of fatal poisoning caused by drug automatism.

Aitken & Proudfoot (1969) examined 994 poisoning patients admitted to a hospital and discovered that 2.9 % of them denied the poisoning. These writers emphasized however, in contrast with Richards, that this did not involve amnesia due to a poisoning but psychological repression and denial. Dorpat (1974) for his part, pays attention to the fact that not even experimentally has it been possible to demonstrate that barbiturates in therapeutic doses would cause amnesia and loss of reminiscence of having ingested drugs. On the other hand, it is clear that many psychopharmaca and alcohol influence consciousness and the so-called ego functions. So they can impair defences against the acting out of self-destructive impulses (Dorpat 1968).

The above-described observations on drug automatism as well as the criticism directed against it have been based mainly on non-fatal poisonings. There are only a few studies which have investigated fatal poisonings employing as the method the so-called psychological autopsy. Litman et al. (1963) investigated 100 equivocal deaths, Davis & Spelman (1968) examined 511 and Curphey (1968) 440 fatal barbiturate poisonings, and none of these investigators could verify one single case of drug automatism. Dorpat (1974) has suggested that inclination to the concept of drug automatism in connection with fatal drug poisonings often covers a willingness to deny the existence of self-destructive tendencies. This willingness is met not only in patients but also in relatives, and even physicians investigating the matter may harbour such tendencies. On the other hand, all fatal drug poisonings are not suicides. Curphey (1968) discovered in his own study that of the 440 fatal barbiturate poisonings, suicides accounted for 90 %, undetermined deaths for 9 % and accidents for only 1 %. Litman et al. (1963) emphasized that accidental fatal drug poisonings occur particularly to chronic abusers of alcohol who ingest a small dose of a hypnotic when they are heavily intoxicated with alcohol.

Accordingly, in the light of published studies it seems that most fatal drug poisonings, especially when the case involves several brands of drugs or a very great amount of ingested drugs, are more probably suicides than accidents. However, the mode of death should not be determined as suicide unless there

is really sufficient and adequate evidence for intention, but on the other hand, the requirement of evidence should also be observed when ascertaining the mode of death as an accident. In practice this would mean that the undetermined mode of death becomes more pronounced in such circumstances where there are no resources for an intensive investigation. Only a very thorough investigation of the situation preceding death makes it possible to decide whether a death was an accident or a suicide or is the case still left undetermined.

Suicides

According to official statistics, a total of 269 suicides were committed in Helsinki in the years 1960–61 and correspondingly 258 suicides were committed in 1970–71. These figures do not include those suicides which had actually been committed already prior to the years concerned but which had been filed officially in the statistics as having been committed on the date when the body was found. There were no suicides committed by 0–14-year-old children in the years 1960–61 and only two such suicides in the years 1970–71. The calculated suicide rate in the former study period is 29.7 suicides per year and 100,000 population while the corresponding rate for the latter study period is 25.3. The decrease in the suicide rate is distinct but yet does not reach statistical significance (Table 12).

The present author evaluated that of the 269 suicides committed in 1960–61, a total of 225 (83.6 %) were certain suicides and 42 (15.6 %) were almost certain suicides. Two cases (0.7 %) were evaluated as undetermined deaths.

Of the 258 suicides committed in 1970–71, a total of 225 (87.2 %) were evaluated as certain suicides and 32 (12.4 %) as almost certain suicides. In this series, one case (0.4 %) remained as an undetermined death.

When the study periods 1960–61 and 1970–71 are compared with each other, it can be noticed that there are no significant differences between the figures. Yet, in the latter study period the official suicides have been evaluated to be somewhat more probably certain suicides. When the official classification is compared with the categorization presented in this study, it can be clearly perceived that there exists a very great conformity to the effect that the present evaluation did not discover in the official figures so-called "false positive findings" in any noticeable degree. Pronouncedly less than 1 % of the official suicides were evaluated as undetermined deaths.

The suicide rate has diminished in all categories from the study period 1960–61 to the period 1970–71. Particularly in the category of almost certain suicides there has occurred a fair decrease. This change is presumably best

Table 12

Suicides in Helsinki, 1960–61 and 1970–71
Certainty of suicide

Certainty of suicide	1960–61 N = 269		1970–71 N = 258	
	Per cent	Rate per 100,000	Per cent	Rate per 100,000
Certain suicide	83.6	24.8	87.2	22.0
Almost certain suicide	15.6	4.6	12.4	3.1
Undetermined, suicide possible	0.7	0.2	0.4	0.1
Almost certain accident	—	—	—	—
Certain accident	—	—	—	—
Total	100.0	29.7	100.0	25.3

explained by the influence of the new official undetermined-classification which was in effect in the latter study period.

**Probability of Suicide in Official Fatal Accidents,
 Undetermined Deaths and Suicides**

Accidental and undetermined deaths

If we, for the first, assume that the mode of death suicide has been applied in both study periods by employing the same stringent criteria so that really only definitely clear suicides have been classified as suicides, then it can be expected that the new mode of death, undetermined death, has diminished only the proportion of accidental deaths and has not had any effect on the suicide rate. Diminution would be expected to occur especially in the study categories certain suicide, almost certain suicide, and undetermined, suicide possible. Table 5 presents a comparison of accidental deaths in the years 1960–61 and 1970–71. Table 13 illustrates both accidental and undetermined deaths combined, in the years 1960–61 and 1970–71.

When we examine accidental deaths (cf. Table 5) it can be seen that the rate of certain accidents has clearly increased (from 48.1 to 54.9 or 14 %), but at the same time the rate has decreased in those categories where varying suicide probabilities have been evaluated. Moreover, the decrease is the more distinct the more probably suicide is involved.

When survey is made on accidental and undetermined deaths combined (Table 13), it will be noticed that certain and almost certain suicides combined

Table 13

Accidental and undetermined deaths in Helsinki, 1960–61 and 1970–71
Certainty of suicide

Certainty of suicide	1960–61 rate per 100,000	1970–71 rate per 100,000
Certain suicide	0.3	0.2
Almost certain suicide	0.7	1.4
Undetermined, suicide possible	2.3	4.1
Almost certain accident	9.7	10.3
Certain accident	48.1	56.5
Total	61.2	72.3

Table 14

Accidental and undetermined fatal poisonings in Helsinki, 1970–71
Certainty of suicide

Certainty of suicide	Accidental poisonings N = 97	Undeterm'd poisonings N = 20	Accidental and unde- term'd poisonings N = 117	
	Rate per 100,000	Rate per 100,000	Rate per 100,000	Per cent
Certain suicide	—	0.2	0.2	1.7
Almost certain suicide	—	1.0	1.0	8.5
Undetermined suicide possible	1.5	0.8	2.3	19.7
Almost certain accident	5.6	—	5.6	48.7
Certain accident	2.4	—	2.4	21.4
Total	9.5	2.0	11.5	100.0

have increased considerably (60 %) and accidents evaluated as undetermined have increased even still more (78 %). On the other hand, only a very small (6 %) increase has occurred in the category of almost certain accidents, and likewise the increase in certain accidents (18 %) remains clearly smaller than in the categories mentioned above.

These findings appear to support the assumption that the use of the new mode of death, undetermined death, has in the years 1970–71 diminished the proportion of official accidents. It seems that particularly those accidents have decreased in proportion in which the probability of suicide has been regarded as considerable.

Table 14 represents the same issue, but only with respect to fatal poisonings in the years 1970–71. The finding is of corresponding kind.

Undetermined deaths and suicides

It may be assumed that introduction of the new mode of death, undetermined death, has in the years 1970–71 led to such a new diagnostic usage that the undetermined mode of death has been designated often also in such deaths which according to earlier usage would have been classified as suicides. It would be in accordance with this assumption that the proportion of suicides would have diminished and that the diminution would have occurred especially in the categories "almost certain suicide" and "undetermined, suicide possible".

For more detailed analyzing purposes presented below Table 12 compares suicides committed in the years 1960–61 and 1970–71, while Table 15 compares suicides and undetermined deaths combined in the same study

Table 15
Undetermined deaths and suicides in Helsinki, 1960–61 and 1970–71
Certainty of suicide

Certainty of suicide	1960–61	1970–71
	N = 269	N = 323
	Rate per 100,000	Rate per 100,000
Certain suicide	24.8	22.2
Almost certain suicide	4.6	4.4
Undetermined, suicide possible	0.2	2.2
Almost certain accident	—	1.3
Certain accident	—	1.6
Total	29.7	31.7

periods. Suicide rate diminished from the years 1960–61 to 1970–71 by 15 % or from 29.7 to 25.3 (Table 12). The rate of deaths evaluated as certain suicides decreased 11 % while the rate of almost certain suicides decreased as much as 33 %. Observing merely the percentage distribution of suicides into various probability categories, it will be seen that in the latter study period the proportion of almost certain suicides and undetermined deaths had decreased by 3.5 percentage units of from 16.3 % to 12.8 %. Both changes confirm the original assumption.

Table 15 illustrates a comparison between suicides in 1960–61 and suicides and undetermined deaths combined in 1970–71. The distribution of the latter group with regard to the probability of suicide is clearly different. This group is bound to include considerably many probable and certain accidents which are totally absent from the former group.

Inspecting Tables 12 and 15 simultaneously one can compare official suicides committed in 1970–71 and suicides in 1970–71 combined with undetermined deaths in 1970–71. Combining undetermined deaths with suicides does not have almost any influence on the rate of certain suicides (1 %). On the other hand, the effect on the rate of almost certain suicides is very pronounced (42 %), and on the rate of undetermined deaths extremely powerful, even multiplicative. The tables also reveal that deaths classified officially as undetermined deaths include remarkably many (45 %) cases which are almost certain or certain accidents.

The results reported above indicate that consideration of the influence of the undetermined mode of death on suicide figures is not, however, able to explain entirely the decrease apparent in the suicide statistics, from the rate 29.7 in 1960–61 to the rate 25.3 in 1970–71. The rate of almost certain and certain suicides, considering the undetermined deaths, would decrease from 29.4 to 26.6. Thus the decrease in the official suicide rates is 4.4, while the decrease would amount to 2.8 if the influence of the undetermined deaths were taken into consideration. While the suicide rate has diminished 15 % in the light of official rates, the decrease is 10 % when the influence of the undetermined deaths is taken into account. Accordingly, taking the undetermined deaths into account reduces the decrease but does not explain for more than one third of it.

Taking the undetermined deaths into account in the way described in the present study would mean an increase in the official suicide rate for the years 1970–71 by 1.5 or by 6 %.

If the undetermined deaths were added offhand to the suicide rate, as has been suggested (cf. e.g. Barraclough 1972, 1973), this would mean that the increase in the suicide rate would be 6.4 or 25 %. Judging by the results of the present study, such a procedure would lead to the consequence that fatal accidents would move over to the suicide rate in the magnitude of 2.9 or 11 %.

This again would imply a greater error (11 %) than abstaining from such a procedure (6 %).

Accidental deaths, undetermined deaths and suicides

In Helsinki accidental deaths, undetermined deaths and suicides together numbered 823 in the years 1960–61 and there were 996 such deaths in the years 1970–71. The combined mean annual rates of these deaths were 90.7 and 97.6 respectively. The increase in the rate was 7.6 %.

All the above-mentioned deaths were evaluated according to the probability of suicide (Table 16). The rates of both certain and almost certain accidents have increased, while the rates of certain and almost certain suicides have decreased almost as much. The rate of certain accidents has increased 17.5 %, and that of almost certain accidents by 6.1 %. On the other hand, the rate of certain suicides has decreased by 11.6 % and that of almost certain suicides by 15.1 %.

Table 16

**Accidental deaths, undetermined deaths and suicides in Helsinki,
1960–61 and 1970–71.
Certainty of suicide**

Certainty of suicide	1960–61 N = 833, rate per 100,000	1970–71 N = 996, rate per 100,000	Change in rates, per cent
Certain suicide	25.1	22.2	–11.6
Almost certain suicide	5.3	4.5	–15.1
Undetermined, suicide possible	2.5	4.2	+68.0
Almost certain accident	9.7	10.3	+ 6.1
Certain accident	48.1	56.5	+17.5
Total	90.7	97.6	+ 7.6

The rate of the deaths which in the present study have been evaluated as undetermined with regard to suicide has shown the relatively greatest change, an increase of 68.0 % (Table 17 A). Undetermined deaths accounted in 1960–61 for 2.8 % of all the deaths under study and for 4.3 % in the years 1970–71. In the official statistics on the causes of death almost all of these cases are enter-

Table 17

Evaluation of probable suicide rates in Helsinki, 1960–61 and 1970–71

Certainty of suicide	1960–61 rate per 100,000	1970–71 rate per 100,000	Change in rate, per cent
A			
Certain and almost certain suicide	30.4	26.7	–12.2
Undetermined, suicide possible	2.5	4.2	+68.0
Almost certain and certain accident	57.8	66.8	+15.6
B			
Certain suicide and almost certain suicide plus undetermined, suicide possible	32.9	30.9	– 6.1
Almost certain and certain accident	57.8	66.8	+15.6
C			
Certain suicide and almost certain suicide Undetermined, suicide possible plus almost certain and certain accident	30.4 60.3	26.7 71.0	–12.2 +17.7
D			
Certain and almost certain suicide plus one half of the deaths classified as undetermined, suicide possible	31.6	28.9	– 8.5
One half of the deaths classified as undetermined, suicide possible, plus almost certain and certain accident	59.1	68.9	+16.6

ed as accidental deaths in the years 1960–61 and in the years 1970–71 almost one half of them as accidental deaths, the other half as undetermined deaths. The increase in the deaths evaluated as undetermined is explained entirely by the growth of undetermined fatal poisonings and drownings.

If it is assumed that all those deaths which have been evaluated as undetermined deaths in the present study actually have been suicides, the suicide rate would be 32.9 for the years 1960–61 and 30.9 for the years 1970–71. Estimating it this way, the suicide rate has decreased by 6.1 % (Table 17 B).

If, on the other hand, it is assumed that all the deaths evaluated as undetermined deaths have in fact been accidental deaths, the growth of the accidental death rate would increase from 15.6 % to 17.7 % (Table 17 C).

If, again, it is assumed that one half of the deaths evaluated as undetermined have been suicides and the other half accidents, the suicide rate would decrease 8.5 % and the accidental death rate would increase 16.6 % (Table 17 D).

Evaluation of the probability of suicides in different ways produces a uniform result: suicides have most probably decreased and fatal accidents have increased. The decrease of the suicide rate varies, according to the method of evaluation, from 6.1 % to 12.2 %.

Setup of the Study Groups

In the present study suicide refers to those deaths, officially classified as suicides, undetermined deaths or accidental deaths, which have been evaluated with regard to the probability of suicide as certain or almost certain suicides. Such deaths numbered in all 276 in the years 1960–61 and 273 in the years 1970–71. The suicide rates were 30.5 and 26.7 respectively. These suicide cases are further examined in Part II of the present study.

Tables 18 and 19 illustrate how the suicide material has been set up from officially statisticized suicides, accidental deaths and undetermined deaths. The official suicide material of the years 1960–61 underwent 17 changes or 6.2 %. Correspondingly, the official suicide material of the years 1970–71 underwent 19 changes or 7.3 %. These changes exerted an increasing effect on the official suicide rate, for the former study period only by 0.3 and for the latter study period by 1.3. However, a good part of the changes were due to the

Table 18

Setup of the study group of certain and almost certain suicides in Helsinki, 1960–61, as compared with the official modes of death*

Suicides according to official statistics	273
Suicides committed already in 1959	– 4
Suicides missing in official statistics, filed as accidents	+7
Suicides classified in this study as undetermined deaths	–3
Accidents classified in this study as suicides	+3
Total of cases in the present study	276

* Changes: $17/273 = 6.2\%$. An increase of 3 suicides equals +0.3 to suicide rate. Errors in statistics: $11/273 = 4.0\%$. An increase of 3 suicides equals +0.3 to suicide rate.

Table 19

Setup of the study group of certain and almost certain suicides in Helsinki, 1970–71, as compared with the official modes of death*

Suicides according to official statistics	260
Suicides committed already in 1969	–2
Suicide classified in this study as undetermined	–1
Undetermined deaths classified as suicides	+15
Accidental death classified as a suicide	+1
Total of cases in the present study	273

* Changes: $19/260 = 7.3\%$. An increase of 13 suicides equals +1.3 to suicide rate. Errors in statistics: $2/260 = 0.8\%$. A decrease of 2 suicides equals –0.2 from suicide rate.

evaluation methods. From the standpoint of the present study the actual errors amounted to 11 cases or 4.0 % in the material of the former study period and to only 2 cases or 0.8 % in the material of the latter study period. The overall effect of the errors on the suicide rate was very slight. Correction of the errors caused in the suicide rate an increase of 0.3 for the years 1960–61 and a decrease of 0.2 for the years 1970–71.

Three examples of cases in which the present author changed the official mode of death are presented in Appendix 4. Appendix 5, again, represents same characteristics of the study groups.

DISCUSSION

Suicide may be conceived as one stage of a very dynamic and intricate process. It is one outcome of the combined effect of the individual's intrinsic biological and psychological factors, and the interactions between the individual and the networks of human relationships around him and, moreover, a wider external world surrounding the whole individual. If suicide is regarded in this way as an incident which has a relation to the "internal world" of the whole individual and also to the whole "external world", it becomes easier to understand why there are so very different descriptions and definitions of suicide. Most descriptions and definitions of suicide can be conceived as just one outlook which can reach only a part of the whole. Since various researchers have different bases for their views and also different interests, it is only natural that different concepts of suicide are bound to arise.

The definitions of suicide which have been presented in an earlier chapter have their own particular limitations and leanings toward slightly different directions. One issue of cardinal importance involves the relation of suicide to self-destruction in general. Should one emphasize specifically self-destructive tendencies and self-threatening behaviour as a broad general phenomenon of which suicides constitute only a small part? Or should the fundamental angle of study deal with death and the individual's intentional relationship to his own death?

The question concerning the purposes for which definitions are intended arises, in fact, as one of the key issues. Such a practical approach emphasizes the instrumental value of a definition as a means to reach a set aim. The aims of suicide research can be very diversified. The objective may be an improvement in understanding self-destruction in general or death specifically. On the other hand, the aim may be an understanding of entirely different phenomena, like e.g. understanding the social structure of a community and its changes by utilizing suicides as an indicator. Then again, the objectives may be of very

practical nature, like planning the distribution and quality of mental health services or more specifically the development of suicide prevention. For each specific research aim an appropriate operational definition of suicide should be created to be employed in the respective studies.

The practical conduct of research always entails limiting the phenomenon under study and consequently a more or less narrow viewpoint. The limiting process constitutes a major problem if the restrictions imposed by the narrowed viewpoint are forgotten when the results are interpreted.

It cannot be presumed that the official statistics on the causes of death would satisfy very well the specific need of suicide research. The official statistics have been created to serve very different purposes, bearing in mind various resources and restrictions connected with the determination of the cause of death. If students of suicide have at all deliberated the reliability of statistics, they have generally taken a more or less critical stand toward them. Very often, however, the problem has not been recognized at all or it has been mentioned just in passing by making a short remark about the reliability of statistics.

Producing suicide statistics is a multistage process, which is susceptible to the influence of very many factors. The continuity and stability of statistics extending from one decade to another are in many ways ostensible. Statistics are subject to continual and diverse changes, and it is quite difficult to estimate the effects of these changes.

The question is not, after all, whether suicide statistics are reliable or not, but rather whether they are adequately reliable for a given specific purpose. Even though problems involving statistics are universal and common all over the world, answers to these problems should be specific, always fitting a certain project.

The purpose of the present study was to determine the reliability and comparability of suicide statistics in Helsinki for the years 1960–61 and 1970–71. The aim was to compose two groups including all the suicides of the respective study periods, this aim being a part of a larger suicide research project. The starting hypothesis, based on the literature (cf. e.g. Douglas 1967, Shneidman 1976), was the assumption that official suicide statistics do not constitute a sufficiently reliable basis for epidemiological research, and secondly the assumption that the suicide statistics of the years 1960–61 and those of 1970–71 are not comparable with each other. In order to test the stated assumptions, the probability of suicide was evaluated in each case of death by means of a rating scale which was devised for this study as well as basing on an information search method which is described in the chapter "Material and Methods". The employed method may be subjected to critical remarks, even to several such comments.

Of all deaths, the probability of suicide was evaluated in the case of fatal accidents, homicides, suicides and undetermined deaths. In the literature it has commonly been assumed that especially among undetermined deaths, but

also in some measure among violent deaths, especially in fatal accidental poisonings, suicides may be hidden (cf. e.g. Litman et al. 1963, Barraclough 1973, 1974, Brooke & Atkinson 1974, Atkinson et al. 1975). The possibility that there might be concealed suicides among natural deaths in countries where determination of the cause of death is a well-developed procedure, has not been mentioned in the literature. For instance McCarthy & Walsh (1975) discovered a remarkable difference between the official suicide figures and their own findings in Dublin, but suicides were hidden entirely among accidental deaths, not at all among natural deaths. Yet it must be stated that excluding natural deaths from a study always implies the risk that there might be hidden among them some sporadic suicides. For the sake of security, however, those cases of natural death were examined in which the cause of death had remained obscure. Such deaths belong to ICD-categories 795 (sudden death, cause unknown) and 796 (other ill-defined and unknown causes of morbidity and mortality), and deaths classified into these categories numbered two cases in 1960, one in 1961, three in 1970 and three cases in 1971. Of all these deaths, the two cases of 1960 and also two cases from the year 1970 were evaluated as undetermined with regard to suicide. None of all these cases was almost certain or certain suicide. Excluding natural deaths from the study may entail a source of error, which nevertheless has been appraised to be of so minimal importance that it would not exert a significant influence on the results.

Determination of the causes of death has been of a more intensive nature in the years 1970–71 than in 1960–61. For example, medical and medico-legal autopsies have been performed significantly more often in the years 1970–71. Likewise, improvements in the investigating capacity of the police authorities and developments in forensic medical methods result in differences between the two study periods. It may be assumed that a more intensive investigation "discovers" more suicides. In order to evaluate this effect, the suicides were classified in this study as certain and almost certain suicides. By definition, a certain suicide is less dependent on the intensity of the determination of the cause of death, since its criteria involve an intention expressed directly by the decedent himself. On the other hand, among almost certain suicides there are deaths in which the investigation of the cause of death has produced circumstantial evidence of suicidal intention. The suicide rate was, both for certain and almost certain suicides, lower in the years 1970–71 than in 1960–61. In the case of almost certain suicides, the decrease in the rate was, contrary to expectations, still greater. The results points to the fact that the differences in the intensity of determination methods have not had any appreciable influence.

In case of an individual death, determination of the cause of death and the mode of death is always based on individual investigation and not on application of a given standardized method. The procedure gives rise to a possibility of a systematic error. In those deaths in which the data on the incident are

inadequate, like e.g. when people living alone or obscure circumstances are concerned, the mode of death is more likely to remain undetermined. On the basis of adequate information the possibility of suicide can be deliberated with greater certainty. Uncertainty in the evaluation of the probability of suicide is not, however, solely due to weak intensity of investigation or isolated scene of the incident but also the intention to die may itself be of contradictory nature: the individual wants at the same time both to die and to live (cf. Stengel 1972). In the present study the rate of deaths evaluated as undetermined was 0.3 % of the rate of all deaths in the years 1960–61 and correspondingly 0.4 % in the years 1970–71. On the basis of the present study, the ratio of the suicide rate to the rate of undetermined deaths was 12.2 in the years 1960–61 and 6.4 or one half of the former in 1970–71. One half of the increase in undetermined deaths was comprised of drownings, the other half were poisonings. Most of these deaths involved use of alcohol and psychopharmacological drugs. The increase of undetermined deaths may in fact be associated with the increased consumption of alcohol and psychopharmaca in Finland.

Determination of the official mode of death is a rather crude classification practice which does not allow a possibility to evaluate and indicate an individual's intentional relation to his own death (cf. Shneidman 1963, 1976). The physician filling up the death certificate is faced with a difficult evaluation task when he has to consider his stand in regard to the mode of death. In spite of all the information pertaining to the death, the determination of the mode of death, and especially evaluating the suicidal intention, depends after all on the physician's subjective judgment. This situation naturally leads to variation among different physicians. Others observe more stringent criteria with regard to suicide than some others, irrespective of the fact that the official definitions of the modes of death serve as guidance for all physicians (cf. Brooke & Atkinson 1974).

In the present study the author endeavoured to minimize the above-described difficulties by evaluating the probability of suicide by means of a five-category rating scale which was employed by only one evaluator, the author himself. Employment of a probability categorization implies that the results cannot offhand, without any further consideration, be compared with official suicide figures. Stating the mode of death in death certificates has the quality of an official judgment which, among other things, has certain value as evidence in the court. Therefore, it is only natural that specialists in forensic medicine observe more stringent criteria for suicide. Nevertheless, with regard to the official statistics the results of the present study differed only relatively little, in fact surprisingly slightly. As for the years 1960–61, the official suicide statistics underwent in the present study a total of 17 alterations or 6.2 %, and correspondingly for the years 1970–71 the alterations numbered 19 or 7.3 %. Besides, many alterations were only differences in appraisal due to the evaluation method. As actual errors the author regarded 11 cases or 4.0 % in the

1960–61 statistics and only 2 cases or 0.8 % in the 1970–71 statistics.

That the result of the present study conforms with the official classification in such a high degree may be asserted to have arisen from the fact that knowledge of the official mode of death has had influence on the author's decisions concerning the probability of suicide. This point is very difficult to figure out. It was not possible to conduct this study in such a way that the author would not have learned the official mode of death. The author took knowingly a critical stand in each case and pursued the categorization based on the rating scale which was described earlier. Anyway, this does not necessarily mean that the official classification might not have exerted a guiding influence on the categorizing process. In such a case, one might expect that acting as "blind" would result in greater discrepancy from the official classifications. One critical interpretation of the conformity implies that in the present study it was not possible to interview the decedents' relatives intensively. Such a technique would probably have brought about the change that some deaths evaluated as undetermined would have been moved over to the category of suicides. The maximal magnitude of the potential error can be estimated by means of the number of the cases evaluated as undetermined deaths. Such cases accounted in the years 1960–61 for 8.2 % and in 1970–71 for 15.7 % of the number of suicides. In any case it is evident that the suicide rates obtained in this study, 30.4 for the years 1960–61 and 26.7 for 1970–71, are underestimations. If we add to these suicide rates one half of the deaths which were evaluated as undetermined in regard to suicide, the suicide rates would turn out to be 31.6 for the years 1960–61 and 28.9 for 1970–71.

Applying different ways of estimation, at all events the present study indicates a slight decrease in the suicide rate from the years 1960–61 to 1970–71. If one wants to interpret the results still more cautiously, in any case one must admit that at least the suicide rate has not increased significantly but that in the years 1970–71 the suicide problem was of the same or even slightly less magnitude than ten years earlier. According to the evaluations in the present study, among all official fatal accidents there were suicides 1.6 % in the years 1960–61 and only 0.1 % in 1970–71. In the latter study period suicides included among accidental deaths would have caused in the suicide rate an increase of only 0.1. Practically, it may be stated generalizingly that under the circumstances prevailing for the present in Helsinki accidental deaths do not include suicides in any significant degree. This conclusion is similar to the one drawn by Ovenstone (1973) in regard to Edinburgh.

Introduction in the beginning of 1969 of the new mode of death, "undetermined death" has definitely produced an effect on suicide statistics. Of the deaths classified officially as undetermined deaths, the present author evaluated 23 cases as suicides, which equals to an increase of 1.5 in the suicide rate. Employing this method of evaluation it may be stated that the new "undetermined" mode of death in ICD has implied a diminishment of 6 % in the

suicide rate in Helsinki as compared with the years 1960–61. This fact should be taken into consideration when official suicide statistics are being compared. It is quite interesting to notice that this decrease of 6 % is exactly equal to what has been estimated as the influence of the new ICD-classification on the suicide rate in the U.S.A. (cf. Linden & Breed 1976).

Among fatal accidents and undetermined deaths, poisonings constitute the central group of the cases which are undetermined in regard to suicide. It has been considered that the high Finnish fatal poisoning figures cover up suicides (Brooke & Aitken 1974). Nevertheless, the majority of accidental and undetermined fatal poisonings have been evaluated in the present study as other deaths than suicides. The rate of accidental fatal poisonings is increased in Helsinki, as well as in the whole country, by the high rate of fatal alcohol poisonings. In the present study, deaths by alcohol poisoning did not, however, involve suicides. This finding corresponds to discoveries presented earlier in the literature (Harenko 1967, Poikolainen 1977). Even though deaths by alcohol poisoning are not suicides, they can nonetheless be classified most often as outcome of self-destructive behaviour. In most fatal alcohol poisonings the decedent was a middle-aged man with a history of chronic abuse of alcohol. Skid-row level alcoholics accounted for 40 % of these cases. Deaths by alcohol poisoning make up a remarkably numerous group of deaths which should be treated together with suicides as a part of the multifaceted problem of self-destruction.

Deaths by drug poisoning constitute a problematic group because it is in these cases that the practical discrimination between suicide, undetermined death and accident is most difficult. In the present study exploration of fatal poisonings did not produce any evidence for the so-called drug automatism which has often been resorted to in explaining fatal drug poisonings as accidents. Indeed, the use of the concept of drug automatism has been criticized by several researchers in the last few years (cf. e.g. Aitken & Proudfoot 1969, and Dorpat 1974).

The possibility of suicides being disguised as automobile accidents has often received quite a lot of publicity. In the present study not a single death sustained in a car accident was evaluated as a suicide. Even though sporadic suicides do in fact occur in connection with car accidents (Näätänen 1972), in the light of the present study such cases do not, however, seem to be of any major importance in the total suicide issue. In this respect the finding corresponds to results reported in the U.S.A. (Tabachnick et al. 1973).

The basic hypotheses of the present study were the assumptions that suicide statistics are unreliable and that suicide statistics cannot be compared reliably with each other as far as the statistics of Helsinki for the years 1960–61 and 1970–71 are concerned. The present study indicated, however, that the official suicide statistics of Helsinki for the years 1970–71 are relatively reliable. The official usage in regard to suicide classification can be judged to be relatively

stringent which leads to underestimation of a certain degree. Due to this circumstance, the official suicides do not include "false positive findings" in any significant number. As compared with the present study, the underestimation in the official figures was of the magnitude of 6 per cent in the years 1970-71. If still broader criteria for suicide are applied, underestimation reaches 9 %. As compared with the years 1960-61, the reliability of statistics has definitely improved. Nevertheless, already in the years 1960-61 the suicide statistics have been of a satisfactory quality. It was evaluated that there were errors in the amount of 4 % in the suicide statistics of that study period. Moreover, when the study periods 1960-61 and 1970-71 are compared, the fact must be born in mind that in the latter study period the mode of death "undetermined death" was in use and, according to the evaluation result in the present study, it has caused a decrease of 6 % in the suicide rate.

As a final outcome of the present study two suicide groups were composed, one including all the suicides committed in Helsinki in the years 1960-61, the other correspondingly including all the suicides in Helsinki in 1970-71. The former group comprised 276 and the latter one 273 suicides. The corresponding suicide rates are 30.4 for the years 1960-61 and 26.7 for 1970-71. Accordingly, the suicide rate has decreased 3.7 or 12 %.

PART II
SUICIDE AND URBAN ENVIRONMENT

INTRODUCTION

In this part of the study suicide will be considered at the community level, regarding it as a disturbance between individual and community. This will be done despite the fact that in the last analysis suicide is invariably an act performed by the individual himself.

Suicide is a most interesting phenomenon from the viewpoint of the relationship between the individual and the community. Particularly earlier suicide was regarded in most communities pronouncedly as a disorder of the individual, in which the community was considered to play no part (cf., e.g., Lönnqvist & Aché 1974). Even when such views were held, however, suicide was not felt to be unrelated to the community, as it was regarded as a punishable act (Aché & Turunen 1977). Thus, indifference was by no means typical of people's attitudes toward suicide. Today our attitudes toward suicide are less clear-cut. They range from negative to indifferent ones or ones favouring prevention (Farberow 1975). Most communities are still likely to consider suicide to be something undesirable, seeking to prevent it in various ways. Yet this prevention has in most cases the nature of intervention and rests on an ethical and moral basis, rather than on a critical consideration of the "part" played by the community in the act of suicide. The view is implicit in it that being in the community is not meaningful enough for the continuation of life. Suicide then signifies, in a sense, that the individual unilaterally severs his relationship of co-operation with the community. Though efforts are made officially to prevent suicides, suicide is enveloped on the other hand in an atmosphere of silence and tacit acceptance: it is considered to be taboo to a certain extent.

It can be maintained, however, that suicide is a symptom of disordered relationship between individual and community. When an individual withdraws from the community, the community should take steps to investigate and analyse the act very carefully, so as to obtain feedback of a sort that could

help the community to remedy the situation. Conceived in this way, suicide concerns not only the individual but also the community, in the sense of being a symptom of a "disturbance" in its functioning.

Sociological Suicide Theories

In the study of suicide, social factors were attended to clearly earlier than in the study of mental health in general. Durkheim (1897, 1962) held the view that the frequency of suicide was a social, not an individual, phenomenon. The victim's moral predisposition to commit suicide was, he felt, the crucial variable, not his individual experiences. By "moral predisposition" Durkheim meant the degree to which the victim was involved in more or less integrated groups and in the values of those groups (Maris 1969). Durkheim's views of suicide as a social phenomenon not actually rooted in the individual have later been criticized by several authors (e.g., Douglas 1967, Maris 1969, 1975), who have pointed out weaknesses in his line of argument.

The sociological study of suicide has later created several suicide theories, most of which rest to a greater or lesser extent on Durkheim's views. A number of overviews of the sociological theories of suicide have been published in recent years (cf., e.g., Douglas 1967, Gibbs 1968, Maris 1969, 1975). The theories of Halbwachs (1930), Henry & Short (1954), Gibbs & Martin (1964) and Douglas (1967) have received the most attention. Halbwachs criticized Durkheim for considering the various social factors separately from one another, stressing himself their joint effects, of which the most important was, in his opinion, social isolation. As a result of isolation the individual lost his stable social relationships, which was particularly characteristic of urban conditions. Halbwachs in fact assumed the rates of suicide to correlate with the degree of urbanization of the population — an assumption which is, however, far from invariably tenable. Yet it is justifiable to say that Halbwachs paid attention to one crucial aspect: the part that broken social relationships and isolation play in suicide.

Henry & Short (1954) associated in their own theory individual psychological factors with institutional factors. They used the concepts of "external restraint" and "internal restraint". Suicide had to do, they felt, with a combination of low external and high internal restraint, whereas the situation was reversed with homicide. This hypothesis, like the one presented by Durkheim, implies a positive correlation between the frequency of suicide and people's social status: the higher the social position of a group of people, the higher will be, according to this hypothesis, the rate of suicide for it. However, many studies (Sainsbury 1955, Yap 1958, Breed 1963, Maris 1969, Lönnqvist & Aché 1972) have yielded results suggesting that the opposite is the case.

According to the "status integration" theory put forward by Gibbs & Martin (1964), the suicide rate for a population varies inversely with the degree of status integration in that population. By "status integration" they meant the extent to which individuals in a population were concentrated in status configurations or status sets. The more homogeneous the position of a population (in respect of, e.g., age, marital status, occupation, income level, religion, etc.) the higher is its status integration and the less is the suicide rate for it. Empirical evidence speaking against this theory, too, has been presented (Maris 1975).

The sociology based on understanding, developed by Weber, has been represented in the field of suicidology by representatives of the so-called ethnomethodology or authors close to this school (e.g., Douglas 1967 and Atkinson 1974, 1975). They stress the individual significance of suicide, in contradistinction to its general social significance. These authors thus feel that suicides ought not to be described in terms of abstract concepts but, instead, an effort should be made to investigate individual suicides and the individual meanings associated with them intensively. For a psychiatrist it is easy to share many of the critical remarks made by Douglas and Atkinson regarding the purely sociological study of suicide. On the other hand it is hard to accept the view that ethnomethodology would be the only correct approach. The aims of a study will determine the choice of the method for it; and when a choice regarding the method has been made, this will impose restrictions of its own on the study.

Numerous studies have shown that suicides have intimate connections with the environment surrounding those committing suicide. Suicide rates vary widely from one environment to another. The various theories so far advanced have, however, succeeded only deficiently in explaining this variation. As a matter of fact, suicide should also be seen as a very individual event, with which also highly individual meanings are associated, and thus the possibilities of general theories of explaining the occurrence of suicides are limited. It would be necessary, therefore, to seek to consider individual and social factors simultaneously to an increasing extent.

Mental Health and Urban Environment

A rather general, nearly myth-like view holds that urbanization is conducive to an increase in the frequency of mental health disturbances in general, and that suicides, in particular, are frequent in urban conditions. Several books and overviews concerned with the relationships of urbanization with mental health have been published in recent years (see, e.g., Dohrenwend & Dohrenwend 1974, Kaplan 1971, Sadock & al. 1975). As stated by Srole (1972), the representatives of the field may be easily led to a pro-urban versus anti-urban controversy. Unfortunately, however, the comparative urban/rural studies so

far conducted are few in number. In their surveys of such studies, Dohrenwend & Dohrenwend (1969, 1974) have stated that in their opinion the results speak for the existence of a tendency for the total rates of psychiatric disorder to be higher in urban than in rural areas. The differences concerned are so slight, however, that Srole (1972), for example, has interpreted the same results by stating that "they do not sustain the long held and popular verdict that cities are generally guilty of greater psychiatric pathogenicity than are members of the genus "rural-village'."

The position of a classic among the studies on the distribution of psychic disturbances within an urban area has been accorded to the study of Faris & Dunham (1939) concerning Chicago. The authors found that psychoses were most frequent in the slum areas in the centre of the city. On the basis of this they formulated the hypothesis that the circumstances in the centre tend to create an isolation situation (an "extended isolation of the person") that is liable to produce schizophrenia (Dunham 1955).

A central position among later mental health studies regarding urban environments has been obtained by the New Haven Study by Hollingshead & Redlich (1958) and the Midtown Study by Srole & al. (1962). The significance of the social environment for mental health is stressed in both of these studies. Hollingshead and Redlich showed how the frequencies of psychiatric disturbances were higher in the lowest social groups than in any other groups in New Haven; whereas Srole and his coworkers reported that sociocultural circumstances caused distinct differences in the mental health of the population in the Manhattan area. Following the publication of these studies, a great deal has been written particularly about the relationship of the social position and mobility of the population to mental health. Dohrenwend & Dohrenwend (1969) stated, on the basis of the literature, that the inverse relationship observed between the overall rates and social class was mainly an urban phenomenon. The well-known selection and causation hypotheses have been formulated in order to account for the kind of concentration in question. Yet the factors responsible for the concentration of mental health disturbances in the lowest social classes and, at least in some cities, in the central areas are still obscure in several respects. Yet there is some evidence speaking for a partial correctness of both hypotheses.

It is partly misleading to contrast urban with rural areas and central city areas with suburban areas, since the circumstances to which these terms are used to refer differ from one locality to another. Moreover, various communities are subject to a more or less intense, continuous process of change. In many cases the process of change is so strong that the distinction between urban and rural areas is not meaningful at all; (Levitt 1972). Ødegaard (1946) stressed in his own study dealing with Norway that those who did not move to towns had more often mental health disturbances. Srole (1972), again, pointed out that there are differences between various kinds of environment in the attitudes

adopted toward mental health disturbances. Nevertheless, an urban community may provide an easier environment for discontented and maladapted adults to adjust and hide than a small community.

It has become increasingly general to consider the mental health of various communities starting from increasingly comprehensive frames of reference. Leighton (e.g., 1971, 1974) has advanced an integration-disintegration theory of his own, in which a central role is played by the assessed functioning of the community. In a well-functioning and well-integrated community mental health disturbances are few in frequency, whereas such disturbances are more frequent in a more poorly functioning, disintegrated community. Moos (1975) speaks of social ecology as the multi-disciplinary study of the impacts that physical and social environments have on human beings. Its primary concern is with the assessment and optimization of human milieu. The knowledge produced by the study of mental health about the influence of the environment on the individual may, on the other hand, help to maximize the probabilities of human growth and lead toward the effective modification of institutions to promote the constructive handling of life stresses.

Suicide and Urban Environment

Both Morselli (1882) and Durkheim (1897) already asserted, on the basis of the available statistics, that suicides were more frequent in urban than in rural conditions. A similar observation has also been made later so frequently that it has often been regarded as an established fact that the rates of suicide for urban populations exceed those for the corresponding rural populations. Nevertheless, the distribution of suicides between urban and rural areas has developed differently in different countries, and the concentration of suicides in towns, and particularly in big cities, is by no means self-evident (Dublin 1963, Kramer & al. 1972, Linden & Breed 1976).

Studies on the distribution of suicides in the various parts of urban areas have often yielded results similar to those obtained by Cavan (1928) in his study concerning Chicago in 1919–21 and by Schmid (1928) in his study concerning Seattle in 1914–25: suicides seem to concentrate in several towns in the residential areas located in the centre of the town. Both investigators ascribed their findings partly to social disorganization. Similar results have afterwards been obtained, e.g., for Minneapolis (Schmid 1933), Chicago regarding the years 1929–36 (Mowrer 1942) and Providence (Faris 1948).

Sainsbury's (1955) study on London for the years 1919–23, 1929–33 and 1940–44 has proved an important piece of ecological research. The author found notable differences in suicide rates between the various parts of the city. Moreover, the differences remained largely similar in direction from one research period to another, in spite of considerable changes in population. The

suicide rate correlated with social isolation, social mobility and social disorganization. Suicide rates were highest in West End and North-West London, where both class and spatial mobility are highest, small flats absent, and relationships impersonal. On the other hand, suicide rates were low in the peripheral southern boroughs where family life and stability prevailed, and in many of the working-class districts whose residents were locally born and where life was more neighbourly. Sainsbury found, moreover, a significant correlation between the rates of suicide and those for mental disorder. In his opinion, the same order of social factors responsible for high suicide rates in the boroughs may also account for the pattern of mental disorder rates.

Yap's (1958) study of suicide in Hong Kong in 1953–54 yielded very similar results. The rates of suicide were significantly higher in the city area than in the surrounding rural districts. The highest rates were found among the low-income and low-prestige groups. Yap also sought to explain his findings in terms of disorganization. He spoke of disorganization in the sense meant by Faris (1948): "disruption of the functional relations among persons to a degree that interferes with the performance of the accepted tasks of the group."

In the United States attention had already been paid by Cavan (1928), Schmid (1928, 1933) and Queen & Thomas (1939) to the fact that suicides seemed to correlate with crimes and sociopathic conditions within the various parts of the town. Porterfield & Talbert (1948) were unable, however, to make any similar observation. Porterfield (1952) investigated this point more in detail regarding Fort Worth in the years 1930–49. He found that suicides were associated with the above-mentioned conditions only under certain circumstances. Areas with high suicide rates and low crime rates were high in social status, high in the residence of native whites and executives, but low in the index of churches. In the areas of low suicide and high crime rates the situation was diametrically opposite. Areas high in both suicide and crime rates were near the heart of the city and were low in social status. Areas which were low both in suicide and crime rates were distributed irregularly between the above-mentioned areas and were characterized by high rates in social status, high in native whites and low in church congregations.

The uneven regional distribution of suicides under urban conditions has been investigated in the case of many big American cities. Shneidman & Farberow (1960) found that, in 1957, for two out of nine rather extensive research areas in Los Angeles County the rates of suicide were high. Characteristic of these areas was that they included apartment house areas of all types. The principal observation was, however, that suicides were distributed comparatively evenly between the various parts of the area. Seiden (1967) found that, in 1960, the rate of suicide for San Francisco was twice as high as the rate for its surroundings and that a similar concentration of suicides in Manhattan was in the same year observable regarding New York. Attkisson (1970) made a separate study of the skid row area of San Francisco in the years 1958–67, finding that

the suicide rates for this area were twice the corresponding rates for the rest of the city. Bogue (1963) had already earlier found the suicide rates of the skid row area of Chicago to be five times the corresponding rates for the other parts of the city. Morris & al. (1974) reported that in 1972 the highest suicide rates in Philadelphia were those for its central area, which included a skid row and cheap boarding houses; these rates were four times as high as those found in an area characterized by relatively stable white ethnic neighbourhoods.

Maris (1969) examined the distribution of suicides in Chicago between the same areas that Cavan (1928) had used in his study 40 years previously. For the five-year period 1959–63 it proved possible to combine the research areas into four groups according to the suicide rates and the background variables used. The rates were high in the "gold coast area", which was characterized by a high educational level and good social position of the population and by high mobility and low numbers of negroes and unemployed people. The "skid row" area also had high suicide rates. On the other hand, the frequencies of suicides were low both in the suburban area and negro area. Maris felt that "areas with high suicide rates can be distinguished from areas with low suicide rates by an older population, slightly more education and income, far more white-collar workers, fewer unemployed, far fewer negroes, more foreign stock, much lower population per household, more substandard housing, and slightly more residential mobility."

Newman & al. (1972) studied relationships between suicide rates and a number of community characteristics in two metropolitan areas, in Chicago in 1959–63 and in Fulton County (Georgia) in 1962–67. In both areas the rates of suicide correlated significantly with the percentage of women in outside employment, the age of the population and the percentage of non-white population; and, in Fulton County, in addition, with social rank; and there was an almost significant correlation between suicide rate and the unemployment rate for men. The authors regarded the correlation between suicide rate and women's outside employment as a new finding and interpreted it as a possible indication of the fact that men in the areas concerned did not take good care of their traditional role as the breadwinner for the family.

Suicides committed in urban environments have also received a great deal of investigation in Great Britain. Capstick (1960) investigated suicides in Wales in 1951–55, finding that suicide rates were higher in urban than in rural areas. Stengel & Cook (1961) compared three industrial towns located in North England as regards the rates of suicide. The three towns were Sheffield, Leeds and Burnley. The last-mentioned was much smaller than the first two, but the suicide rate for it was many times higher. The striking discrepancy between the suicide rates was found to be related to differences in the age structure of the population, to social disorganization and social mobility. Old people were over-represented in Burnley, and this had been caused by changes in industry, as a result of which many members of the younger generation had left the town.

The authors concluded that social changes such as those associated with industrial decline and selective emigration, may increase the proneness to suicide, particularly among the older age groups.

Ropschitz & Ovenstone (1968) studied suicides in the Halifax Area in 1962–64, finding that the suicide rate in the West Riding surrounding Halifax Borough was slightly higher than in Halifax town. They supposed that this unusual finding was due to the fact that the regions surrounding the town were not typical rural districts but characterized by industrialization which was accompanied with social mobility and disintegration.

Whitlock (1973) examined deaths caused by suicide in 28 London Boroughs for the period 1959–63. He found that their distribution was very similar to the one observed by Sainsbury (1955) four decades earlier. Suicide rate correlated most strongly with the percentages of the unmarried and divorced, of women, and of people living alone, the percentage of foreign-born people and that of members of the upper social classes. High rates occurred in areas with the greatest percentage of persons in the upper socio-economic classes, whereas the converse was true for the low suicide boroughs. Whitlock concluded that his findings indicated clearly enough that the factors influencing suicide rates in London were consistent and enduring and almost certainly related to the demography and environmental and social patterns of various boroughs.

McCulloch & al. (1967) studied suicides in Edinburgh, finding that the presence of much overcrowding was that of their variables which correlated most strongly with the suicide rate. It is interesting enough that, when Lester (1970) carried out an identical study of Buffalo, in the United States, the results were distinctly different. There were few significant correlations between suicide rates and social indices. In Buffalo the rates of suicide correlated with the numbers of old people, people high in educational level and the number of widowed and divorced persons, but, contrary to the case with Edinburgh, they did not correlate at all with, e.g., variables indicating social disorganization.

Bagley & al. (1973) examined the distribution of 150 suicides, 900 psychiatric patients, 1300 crime delinquency cases and 800 child welfare problem cases in Brighton (population 164,000) and the relationships of these distributions with a number of demographic variables recorded for the 19 wards of the city. The suicides had been committed in the years 1963–69 and the psychiatric patients were from the years 1966–68. The authors found that the rates of all psychiatric illnesses were strongly intercorrelated; this applied to neuroses and personality disorders, depressions, affective psychoses, senility, organic disorders, parasuicide, alcoholism, addictions, schizophrenia, suicide, indictable crimes and child welfare problems. These behavioural pathologies were particularly likely to occur in the central parts of the city, which were marked by a high proportion of overcrowding, of single person households, of in-migrants and poor housing conditions. The underlying link for all these

phenomena was most probably the availability of a certain kind of housing, which attracted both university students, unstable drifters and unsupported mothers. Unlike the other disorders attended to in the study, suicide and affective psychosis had significant correlations with the proportion of individuals in the highest social classes.

Suicide and Urban Environment in Finland

In Finland, the difference between urban and rural suicide rates has diminished steadily since the 19th century. Previously the former greatly exceeded the latter, but since the 1960s the difference has been small. This small difference has been due to the fact that the rates for women have continued to be comparatively low in rural areas (Lönnqvist 1972). In 1969, for instance, the ratio of male to female suicides was 2.6 in the three largest towns of the country, 3.4 in other towns and 4.6 in rural areas. The process of change of rural-urban differences as a longer-run problem has also been considered by Markelin (1972), among others. He holds that the effects of rural-type environments on the occurrence of suicides may be regarded as contextual effects: variations in suicide rates can be accounted for by social variables.

Since the 1820s the suicide rate for Helsinki, the capital city, has exceeded the rate for the rest of the country. Annual suicide frequencies and suicide rates for the years 1951–73 in Helsinki and the whole country are given in Table 20. The rate for the whole country has continued to approach the rate for Helsinki: in the early 1950s the rate for Helsinki was more than one and a half times the rate for the whole country, but in the 1960s this ratio fell below 1.5 and during the current decade the difference between the capital and the rest of the country in suicide rate has almost entirely disappeared. When the rates for the two sexes are considered separately (Table 21), particularly the rate of women is found to have been definitely higher in Helsinki than it is elsewhere in the country, whereas there has been less difference between the capital city and the rest of the country in the rates for men. Compared with the whole country, the rate for men in Helsinki was about one and a half times as high in the 1950s and about 1.3 times as high in the 1960s, whereas in the 1970s the suicide rate for Helsinki men has been of the same order of magnitude as the rates for men in the rest of the country. On the other hand, in the 1950s the rate for Helsinki women was over twice the rate for women in the whole country. The ratio has declined steadily, but in the early 1970s it was still as high as 1.6.

The uneven distribution of suicides between the various parts of Helsinki was first attended to by Achté & Järvenpää (1962). They found that the rates for 1955–60 had been high in certain central parts of Helsinki, in Inner Helsinki in general and also in a few disconnected areas in Outer Helsinki. For the divi-

Table 20

**Suicides in Finland: frequencies and rates for Helsinki
and the whole country in 1951-73**

Year	Helsinki		Whole country		Ratio of rates
	Number of suicides	Rate per 100,000	Number of suicides	Rate per 100,000	
1951	101	27.0	636	15.7	1.72
1952	96	25.0	722	17.6	1.42
1953	113	28.7	722	17.4	1.65
1954	129	32.0	793	18.9	1.69
1955	132	32.0	846	20.0	1.60
1956	172	40.5	961	22.4	1.81
1957	152	34.8	949	21.9	1.59
1958	151	33.8	933	21.3	1.59
1959	150	32.9	881	20.0	1.64
1960	137	30.5	908	20.4	1.50
1961	136	29.7	922	20.6	1.44
1962	158	33.6	994	22.1	1.52
1963	135	27.9	873	19.2	1.45
1964	121	24.5	908	19.8	1.24
1965	149	29.7	911	20.0	1.48
1966	136	26.4	892	19.5	1.35
1967	150	28.7	933	20.6	1.39
1968	163	30.8	1015	21.9	1.41
1969	172	32.3	1096	23.7	1.36
1970	134	25.2	983	21.3	1.18
1971	126	23.8	1003	21.7	1.10
1972	155	29.3	1113	24.0	1.22
1973	120	22.9	1097	23.5	0.97

sions of the area of the City of Helsinki, see Appendix 1. Later they subjected the suicides committed in the various parts of Helsinki in the years 1956-65 to somewhat more detailed examination (Achté & Järvenpää 1969). The suicide rate appeared to be high particularly in areas where the proportion of persons in the lowest social group was large. A comparison of the suicide rates by large areas (the main divisions of Helsinki) in 1956-60 and 1961-65 revealed that suicides of men were concentrated in the same parts of the city during both periods ($p < .05$). In contrast to this, no similar correlation was found between the suicides committed by women during these two periods of time.

Table 21

**Suicides in Finland: rates by sex for Helsinki and
comparisons with the whole country in 1951–73**

Year	Suicide rates in Helsinki			Helsinki/Whole country	
	Male	Female	M/F Ratio	Male	Female
1951	47.4	11.7	4.0	1.8	2.0
1952	44.2	10.5	4.2	1.5	1.7
1953	41.3	19.2	2.2	1.4	3.1
1954	49.5	18.8	2.6	1.6	2.5
1955	51.5	17.1	3.0	1.6	2.0
1956	64.1	22.4	2.9	1.7	2.5
1957	53.2	20.7	2.6	1.5	2.1
1958	54.5	17.9	3.0	1.6	1.8
1959	47.8	21.4	2.2	1.5	2.4
1960	42.1	21.4	2.0	1.3	2.4
1961	43.6	18.7	2.3	1.3	2.1
1962	46.7	23.2	2.0	1.3	2.3
1963	43.6	15.6	2.8	1.4	2.0
1964	34.3	16.7	2.0	1.1	1.8
1965	46.7	16.1	2.9	1.4	2.0
1966	41.6	14.3	2.9	1.4	1.9
1967	43.9	16.5	2.7	1.3	1.9
1968	45.1	12.4	2.3	1.3	2.0
1969	48.6	19.3	2.5	1.3	1.9
1970	36.5	16.2	2.2	1.1	1.8
1971	35.3	14.6	2.4	1.0	1.6
1972	46.4	15.6	3.0	1.2	1.6
1973	30.9	16.4	1.9	0.8	1.6

Lönnqvist & Achté (1972) made a more detailed study of the relationship between suicide rates and social background factors in Helsinki in the years 1956–65. The rates for the 48 sections or districts of Helsinki covered by their study ranged from 7 to 76. There was a clear tendency for the suicides to concentrate in the central parts of the city. During the latter part of the ten-year period suicides clustered even more definitely in the central areas. Of the sociological variables used to characterize the various districts of Helsinki, the percentage of members of the lowest social group, the percentage of people living alone, the number of small households, the percentage of old people

and population density correlated significantly with the suicide rate. The suicide rate also correlated unexpectedly strongly with variables used to describe psychiatric morbidity. The correlations that it bore to the rates of admission to hospital for psychiatric disorders in general, for psychoses, for schizophrenia and for alcohol and drug abuse were highly significant ($p < .001$). On the other hand, the correlation between suicide rate and the rate of admission for neuroses was only almost significant ($p < .05$). The districts with low suicide rates clearly differed from those with high rates in the sociological variables and in variables used to describe psychiatric morbidity. When the various districts were classified into the large areas (the official main divisions of the city), three areas with high suicide rates were distinguishable in Inner Helsinki: a typical central part of the city, a so-called slum area surrounding it and an area typified by high standards of living. In the suburban districts, or Outer Helsinki, a small slum area was distinguishable, for which the suicide rate was as high as the rate for the City Centre.

AIMS OF THE STUDY

The purpose of the study was to examine

1. the distribution of suicides between various parts of Helsinki in 1960–61 and 1970–71;
2. the correlation of the suicide rate with a number of variables characterizing the population and its environment of life;
3. the extent to which variations in the suicide rate can be explained, in the sense of stepwise regression analysis, in terms of these variables;
4. the changes that had taken place in suicide rates between 1960–61 and 1970–71;
5. correlations of the changes in suicide rates with demographic changes between 1960–61 and 1970–71;
6. the extent to which changes in suicide rates could possibly be accounted for in terms of variables describing demographic and environmental changes between 1960–61 and 1970–71;
7. the description of the population of Helsinki and its environments of habitation in terms of a few basic dimensions (factors), the grouping of the residential areas of the city in terms of these dimensions and the variation of the suicide rate between the areas thus obtained; and
8. the character of high and low suicide risk areas more specifically.

The following hypotheses were formulated for the study:

1. The frequency of suicide has connections with social environment. Suicide rates are different in different environments. Changes in social environment are likely to be reflected as changes in suicide rates.
2. In areas and population groups characterized by good functioning, or integration, suicides are infrequent. In areas and population groups that function poorly, or have a low degree of integration, suicides are likely to be more frequent. Integrative changes tend to decrease and dis-integrative changes to increase suicides.
3. Areas and population groups characterized by a good social position and well-being have fewer suicides. Rising well-being tends to decrease suicides.

MATERIAL AND METHODS

The two groups of suicides formed in the first part of the study, consisting of 276 and 272 suicides committed in Helsinki in the years 1960–61 and 1970–71 respectively, constituted the material dealt with in this second part. The 1970–71 group of suicides here included contained only 272 cases, instead of 273 as in the first part, because one case was identified so late that its inclusion here was no longer possible.

The observations in this part of the study relate to population groups formed on a regional basis. In the first instance, use will be made of the official division of the area of Helsinki into 51 Districts. These, again, are grouped in the official statistics of the Municipality of Helsinki into nine so-called Large Areas. Five of the large areas (1–5) form the main city area, or Inner Helsinki, the remaining four (6–9) forming suburban or Outer Helsinki. A list of the districts and their populations, and the numbers of suicides that took place in each district during each of the two two-year periods, is given in Appendix 1. In addition, the districts comprised by each of the large areas are indicated in that appendix, which also includes a map of the districts of Helsinki.

The size of the districts of the city varies widely, and thus, in the smallest districts, the expected value of the frequency of suicide is below one. For the purpose of further analysis each of the small districts for which the expected value of the frequency of suicide was less than one was combined with a district adjacent to it. This combination was carried out in such a way that the districts concerned belonged functionally together and to the same large area. Data on the 37 "Research Areas" arrived at in this way is given in Table 22.

The localization of each suicide in Helsinki took place in accordance with the home address the deceased person had at the time of his death ("permanent population"). The address was obtained primarily from the death certificate and later confirmed on the basis of the police investigation records and tax returns and the information provided by the Address Bureau. The

Table 22

**Numbers of inhabitants and frequencies of suicides in Helsinki
in 1960–61 and 1970–71 by research areas (N = 37)**

No. of area	Name of area *	1960–1961		1970 – 1971	
		Suicides	Population	Suicides	Population
1.	1.	Kruununuhaka	6 13,963	10	10,632
2.	2.	Kluuvi (+3)	9 5,907	5	3,069
3.	4.	Kamppi	14 22,107	13	16,056
4.	5.	Punavuori (+20)	8 15,782	7	13,586
5.	8.	Katajanokka	2 5,062	4	3,935
6.	11.	Kallio	32 36,625	12	31,373
7.	12.	Alppiharju	14 21,051	10	20,219
8.	13.	Etu-Töölö	19 23,750	7	18,119
9.	14.	Taka-Töölö	11 27,534	13	21,077
10.	15.	Meilahti	8 9,808	2	7,398
11.	16.	Ruskeasuo (+17)	2 6,513	6	5,317
12.	18.	Laakso	4 3,864	1	2,903
13.	19.	Mustikkamaa (+10)	7 5,191	2	4,495
14.	21.	Hermanni	2 5,217	1	4,262
15.	22.	Vallila	15 14,554	5	12,351
16.	23.	Toukola	2 3,667	2	3,036
17.	24.	Kumpula	1 4,314	1	3,210
18.	25.	Käpylä	1 13,699	9	10,962
19.	26.	Koskela	0 3,208	1	3,245
20.	28.	Oulunkylä	3 17,438	11	23,144
21.	29.	Haaga	8 24,559	8	27,835
22.	30.	Munkkiniemi	10 21,589	11	21,877
23.	31.	Lauttasaari	5 18,438	7	21,299
24.	33.	Etelä-Kaarela	2 9,674	6	10,581
25.	34.	Pakila	1 7,115	8	8,939
26.	35.	Tuomarinkylä	0 5,073	1	4,015
27.	36.	Viikki (+37,38)	3 8,555	12	18,504
28.	39.	Tapaninkylä	2 9,268	4	9,833
29.	40.	Suutarila	1 2,108	0	3,642
30.	41.	Suurmetsä	5 5,207	4	10,972
31.	42.	Kulosaari	3 3,665	1	5,089
32.	44.	Tammisalo (+43)	3 25,802	16	25,744
33.	45.	Vartiokylä	2 6,423	12	32,082
34.	46.	Pitäjänmäki (+32)	2 8,892	3	12,747
35.	48.	Vartiosaari (+49,51)	1 3,963	5	10,949
36.	52.	Suomenlinna (+6,7,9)	14 22,920	11	19,084
37.	54.	Vuosaari (+47)	1 2,772	8	39,226

* The numbers in parentheses indicate the districts combined with the core district.

persons without a dwelling and those who were temporarily away from Helsinki ("non-permanent population") were dealt with as a separate group.

The bulk of the information concerning the observation units was obtained from the censuses of population taken on Dec. 31, 1960, and on Dec. 31, 1970. The dates of the censuses fell on the midpoints of the research periods. Thus, rather than being truly accurate averages, the values obtained from the census data are in the nature of cross-sections. The possible sources of error attaching to this procedure were discussed earlier (Material and Methods, Part I).

The basic variables used to describe the districts and the various other divisions of Helsinki are listed in Appendix 3. The variables based on the census data are quantitative in nature. In the list of basic variables they are recorded mainly as absolute values, but during the various stages of the analysis they will be used mainly as percentages (or rates per thousand). Moreover, a total of 90 additional variables were formed on the basis of these 56 variables at the various stages of the analysis.

A crucial set of variables is made up of the suicide rate variables. By "suicide rate" will in this study invariably be meant the frequency of suicides per 100,000 persons per year. When the rate has been computed relative to the total population, it will in certain contexts be referred to as a "crude rate", for the sake of clarity and in contradistinction to the corresponding "age-adjusted rate", computed relating the number of suicides to the population aged 15 years and over.

The information yielded by the 1960 census was narrower in scope than that yielded by the 1970 census and its processing for the present study was more difficult. On the other hand, the information available about the population of Helsinki for 1970 was excellent. An effort was made here to choose the variables in such a way that a certain amount of comparable information would be available about both periods of time.

The population variables chosen for the study described the location of the residential area concerned with respect to the centre of the city, its degree of regeneration (i.e., urban renewal and new building), the age and sex distribution of the population of the area, its socio-economic composition and the percentages of certain special population groups in it. These variables were designed to measure the well-being of the population and its degree of integration with the community. The chief measure of well-being employed was the City of Helsinki Statistical Office classification of people into four social groups. In this classification social group I contains persons with a university degree and those in leading positions, social group II contains technical personnel, foremen, small businessmen, social group III skilled workers and social group IV unskilled workers and auxiliary workers. To measure the disintegration — integration dimension, use was made of variables indicating the percentages of adults, old people, and children and the percentages of persons belonging to families and of people living alone. The point of departure thereby was that the

proportion of persons belonging to families, and to families with children in particular, as well as the degree of regeneration (urban renewal and new building), could be used as indicators of the functioning of a residential area.

Quite important for the study are also the so-called mental health variables constructed for both research periods for the evaluation of the mental health of the population. Unfortunately, completely comparable data could not be obtained for the two periods. In the case of 1960 the mental health variables were based on the admissions of the inhabitants of Helsinki to the psychiatric hospitals situated in the Helsinki region in 1960. The variables concerned indicate the numbers of admissions to hospital per 100,000 persons per year (Achté 1972, Lönnqvist & Achté 1972). The mental health variables for 1970 were constructed on the basis of a separate study by the author (Lönnqvist 1977), through which information was obtained about all inhabitants of Helsinki who had in 1970 been under treatment at the University of Helsinki Psychiatric Clinic (N = 181), or at a private psychiatric hospital (N = 118), and the corresponding information about a systematic sample (including every 30th) of those who had been under treatment in Hesperia Hospital (N = 177) and those inhabitants of Helsinki who had been first admitted to hospitals for treatment because of schizophrenia (N = 98). Hesperia Hospital is meant to serve the whole population of Helsinki and accounts for over 90 per cent of the psychiatric hospital services provided to it.

The basic set of data described above was analysed by means of automatic data processing techniques. Use was made of the ordinary statistical methods and, in addition, certain multi-variate methods. An attempt was made to explain the variations observed in suicide rates by means of stepwise regression analysis. The suicide rate was regarded thereby as the dependent variable and the other demographic variables as the explanatory independent variables.

Factor analysis was employed to condense the extensive set of variables. The factors thus obtained were used in an attempt to describe the basic dimensions of the various research areas in a more reduced form.

Factor analysis was an intermediate stage leading to grouping analysis (a sort of cluster analysis to be described later), through which an effort was made to form research areas that would be inwardly as homogeneous as possible.

It should be stressed, finally, that the object of this part of the study was to investigate those environmental circumstances in which suicides occur. The study was a socio-ecological one, i.e., one relating to population groups and their conditions of life. Suicides form a very small minority group (about .03 per cent) of the total population. The features of this minority group may be similar to those of the total population, but they may also be dissimilar. This will be important for us to keep in mind, in order to avoid fallacious conclusions (ecological fallacy). Suicide will thus be investigated in this part of the study as a community level phenomenon, the chief emphasis being thereby on the

circumstances; and thus, persons who have committed suicide are not investigated as a restricted special group. For a discussion of the methodological problems of ecological study involved, see, e.g., Bagley & al. (1973).

RESULTS

Suicides in 1960–1961

Suicides and suicide rates in Inner and Outer Helsinki

Inner Helsinki is made up of Large Areas 1–5, comprising Districts 1–27 and 52. The rest of the city belongs to Outer Helsinki. The distribution of suicides between Inner and Outer Helsinki in 1960–61 is shown in Table 23.

Three quarters (76.7 per cent) of the suicides concerned took place in Inner Helsinki. The suicide rate for Inner Helsinki was 32.3, the rate for Outer Helsinki being 14.4. The difference was quite notable and statistically highly significant ($t = 3.77$; $p < .001$). In the age-adjusted rate (15–) the difference between Inner and Outer Helsinki was slightly less (39.5/20.2) but still significant. The suicides of men concentrated in Inner Helsinki more clearly than those of women. The Inner Helsinki/Outer Helsinki ratio between the rates of men was 2.8, the corresponding figure for women being 1.8. On the other hand, the ratio of the rate of men to that of women was 2.0 in Inner Helsinki and as low as 1.3 in Outer Helsinki.

Suicides in the various Large Areas

The distribution of suicides between the nine main divisions or Large Areas of Helsinki is shown in Table 24. In area 4 (Districts 10, 11, 12, 19, 21, 22) the rate was 42.4, or definitely higher than in any of the other eight large

Table 23

Suicides and suicide rates in Inner and Outer Helsinki in 1960-61

Variable	Inner Helsinki	Outer Helsinki
Total suicides	171	52
Male suicides	102	28
Female suicides	69	24
Suicide rate, crude	32.3	14.4
Suicide rate, 15-	39.5	20.2
Rate for male population	46.0	16.7
Rate for female population	22.4	12.4

Table 24

Suicides and suicide rates by Large Areas in Helsinki in 1960-61

Area	Suicides				Suicide rate		
	Total	Male	Female	Crude	15-	Male	Female
1.	35	21	14	31.2	37.6	44.4	21.6
2.	18	12	6	30.2	36.8	47.6	17.5
3.	44	21	23	30.8	37.2	37.5	26.4
4.	70	44	26	42.4	51.7	61.0	27.9
5.	4	4	0	8.0	10.6	18.7	0.0
6.	27	14	13	16.2	22.1	18.5	14.3
7.	4	1	3	6.8	10.0	3.6	9.5
8.	11	7	4	21.9	30.3	29.2	15.2
9.	10	6	4	11.7	17.0	15.0	8.8

areas. In Areas 1, 2 and 3, belonging to Inner Helsinki the rates were also rather high. By contrast, Area 5 differed not only from the rest of Inner Helsinki but from the rest of whole Helsinki to a statistically significant extent ($p < .05$), in that the suicide rate for it was notably low (8.0). This area comprises Districts 23-27.

In Areas 6-9, forming Outer Helsinki suicide rates were much lower than in Inner Helsinki. The highest rate, 21.9, was that for Area 8 (Districts

36–41). The rates for the other three areas were significantly ($p < .05$) below the average for total Helsinki. In Northern Outer Helsinki, comprising Districts 28, 34–35, the rate was particularly low (6.8). Geographically this area is adjacent to Area 5, which had the lowest rate in Inner Helsinki. Thus there is in northern Helsinki an extensive residential area (Districts 23–28 and 34–35) where suicide rates are significantly lower than elsewhere in the city.

When the suicide rates were adjusted for age (15–), those for Outer Helsinki rose relatively somewhat more than those for Inner Helsinki, but the overall picture remained unchanged.

Finally a separate consideration of the rates for the two sexes revealed that the high suicide rate in Area 4 was due to the high rate for men in that area. Thus, in 1960–61 suicide rates for men seemed to have been particularly high in an area comprising the Kallio, Sörnäinen, Alppiharju, Hermannin and Vallila Districts.

Suicides in the 37 Research Areas

The distribution of suicides between the 37 research areas formed for the purposes of this study of the 51 districts of Helsinki is shown in Table 25. In considering the suicide rates for these research areas it should be borne in mind that even comparatively slight changes in the numbers of suicides will be reflected as distinct changes in the rates because the number of suicides remains low for each of these areas. (See map on suicide rates in App. 1).

The areas with high suicide rates were located within the boundaries of Inner Helsinki. The highest rate, 76.2, was that for Research Area 2 (Kluuvi-Kaartinkaupunki), situated at the very centre of the city. Another high-rate area consisted of Research Areas 11, 19 and 22, or the Districts of Kallio, Sörnäinen-Mustikkamaa and Vallila. The rates were also high in Districts 13, 15 and 18 (Etu-Töölö, Meilahti and Laakso) in Western Inner Helsinki.

The City Centre, forming the darkest area in respect of suicide rates, is surrounded by Research Areas 1, 5, 8 and 14 (Kruununhaka, Punavuori-Länsisatama, Katajanokka and Taka-Töölö), where the suicide rates were notably low in comparison with the rest of Inner Helsinki.

In the research areas belonging to Outer Helsinki the suicide rates were distinctly lower than in those belonging to Inner Helsinki. The rates for an extensive area in the northern part of the city, comprising Research Areas 24, 25, 26, 28, 34, 35, 36 and 39 were particularly low. The Districts of Kumpula, Käpylä, Koskela, Oulunkylä, Pakila, Tuomarinkylä, Viikki, Pukinmäki and Tapaninkylä belonged to this area.

In research Areas 41 and 42 (Suurmetsä and Kulosaari) the rates were clearly higher than in Outer Helsinki in general. The frequencies of suicides were in these regions so low, however, that chance may have played a large part here.

Table 25

Suicides in Helsinki: frequencies and rates for the 37 research areas in 1960–61

No. of area	Name of area	Suicides	Rate, crude	Rate, 15–
1.	Kruununhaka	6	21.5	26.0
2.	Kluuvi (+3)	9	76.2	93.0
4.	Kamppi	14	31.7	38.1
5.	Punavuori (+20)	8	25.2	30.2
8.	Katajanokka	2	19.8	23.5
11.	Kallio	32	43.7	52.7
12.	Alppiharju	14	33.2	41.0
13.	Etu-Töölö	19	40.2	46.8
14.	Taka-Töölö	11	20.0	24.0
15.	Meilahti	8	40.8	50.7
16.	Ruskeasuo (+17)	2	15.4	20.4
18.	Laakso	4	51.8	64.3
19.	Mustikkamaa (+10)	7	67.4	82.1
21.	Hermannin	2	19.2	24.1
22.	Vallila	15	51.5	63.5
23.	Toukola	2	27.2	37.4
24.	Kumpula	1	11.6	16.0
25.	Käpylä	1	3.6	4.8
26.	Koskela	0	0.0	0.0
28.	Oulunkylä	3	8.6	13.7
29.	Haaga	8	16.3	22.8
30.	Munkkiniemi	10	23.2	30.7
31.	Lauttasaari	5	13.6	18.4
33.	Etelä-Kaarela	2	10.3	14.5
34.	Pakila	1	7.0	9.6
35.	Tuomarinkylä	0	0.0	0.0
36.	Viikki (+37,38)	3	17.5	24.4
39.	Tapaninkylä	2	10.8	14.7
40.	Suutarila	1	23.7	34.4
41.	Suurmetsä	5	48.0	66.6
42.	Kulosaari	3	40.9	54.6
44.	Tammisalo (+43)	3	5.8	8.7
45.	Vartiokylä	2	15.6	22.7
46.	Pitäjänmäki (+32)	2	11.2	14.7
48.	Vartiosaari (+49,51)	1	12.6	18.0
52.	Suomenlinna (+6,7,9)	14	30.5	37.4
54.	Vuosaari (+47)	1	18.0	22.3

Suicides in the 27 Research Areas

For the purpose of further analysis the number of research areas was then reduced from 37 to 27 by combining the smallest research areas with larger ones adjacent to them. This was done with the object of diminishing the influence of chance on the suicide rates and, thus, of increasing the reliability of the analysis. The combination took place in accordance with the principle that, when one research area was combined with another, it was combined with an area that belonged to the same large area and had a natural, functional connection with it. The 27 research areas thus obtained are listed in Table 26. The code number and name of each research area are based on a single district, the numbers of the other districts belonging to it being indicated in parentheses in the table.

A comparison of the suicide rates for these 27 research areas with those for the 37 research areas reveals that the dispersion of the rates clearly diminished. While the mean for the 37 research areas was 24.7 the standard deviation being 18.1, the corresponding figures for the 27 research areas were 22.8 and 13.3 respectively.

The suicide rates for the 27 research areas, given in Table 26, are very similar to those for the 37 research areas, set out in Table 25. However, of the high-rate areas in Inner Helsinki, Districts 2 and 3 (Kluuvi and Kaartinkaupunki) and District 18 (Laakso) are combined with areas having somewhat lower rates. In Outer Helsinki the same is true for District 42 (Kulosaari).

Correlations of suicide rates with other variables

The correlations of the suicide rate with a number of variables characterizing the 37 research areas in respect of location, the distribution of the population by age, sex and socio-economic position, the presence of certain special population groups and psychiatric morbidity are presented in Table 27.

The variable with which the suicide rate correlated the most strongly, and statistically highly significantly ($p < .001$), was the percentage of persons living alone. There were further significant ($< .01$) correlations with the composition of the population: the suicide rate correlated positively with the percentage of adult population (15—), which of course at the same time means a negative correlation with the percentage of children (0—14 yr). The location of the research area in Inner Helsinki or near the City Centre and the smallness of its area correlated to an almost significant extent with the suicide rate.

It is noteworthy that the correlations of suicide rate with the variables indicating the socio-economic composition of the population were low. Also, the correlations it bore to the psychiatric morbidity variables were not particularly high.

Table 26

Suicides in Helsinki: frequencies and rates for the 27 research areas in 1960–61

No. of area	Name of area*	Suicides	Rate, crude	Rate, 15—
1.	Kruununhaka (+ 2,3)	15	37.8	45.8
4.	Kamppi	14	31.7	38.1
5.	Punavuori (+ 20)	8	25.2	30.2
12.	Alppiharju	14	33.2	41.0
13.	Etu-Töölö	19	40.0	46.8
14.	Taka-Töölö	11	20.0	24.0
15.	Meilahti	8	40.8	50.7
16.	Ruskeasuo (+ 17,18)	6	28.9	37.5
19.	Mustikkamaa (+ 10,11)	19	46.6	56.3
22.	Vallila (+ 21)	17	43.0	53.2
25.	Käpylä	1	3.6	4.8
26.	Koskela (+ 23,24)	3	13.4	17.7
28.	Oulunkylä	3	8.6	13.7
29.	Haaga	6	16.3	22.8
30.	Munkkiniemi	10	23.2	30.7
31.	Lauttasaari	5	13.6	18.4
33.	Etelä-Kaarela	2	10.3	14.5
34.	Pakila (+ 35)	1	4.1	5.6
36.	Viiikki (+ 37,38)	3	17.5	24.4
39.	Tapaninkylä (+ 40)	3	13.2	18.2
41.	Suurmetsä	5	48.0	66.6
42.	Kulosaari (+ 43,44)	6	10.2	15.0
45.	Vartiokylä	2	15.6	22.7
46.	Pitäjänmäki (+ 32)	2	11.2	14.7
48.	Vartiosaari (+ 49,51)	1	12.6	18.0
52.	Suomenlinna (+ 6,7,8,9)	16	28.6	34.8
54.	Vuosaari (+ 47)	1	18.0	22.3

* The numbers in parentheses indicate the districts combined with the "core" district.

Table 27

Coefficients of correlation between the 1960–61 suicide rate and the variables used to describe the research areas (N = 37) in Helsinki

Variable	Coefficient of correlation	Level of significance
Location of district(s)		
Inner Helsinki – Outer Helsinki	-.415	x
Distance from centre	-.411	x
Area of district(s) comprised	-.341	x
Age and sex distribution of population (%)		
Adult population, 15–	.459	xx
Women	.299	
Old people, 65–	.121	
Socio-economic status (%)		
Social group I	.047	
Social group II	-.106	
Social group III	-.095	
Social group IV	.168	
Persons who had passed matriculation examination	.144	
Economically active population	.140	
Industrial workers	-.103	
Special population groups (%)		
Persons living alone	.539	xxx
Subtenants	.235	
Swedish-speaking	.231	
Mental health variables		
Persons admitted to psychiatric hospital for treatment in 1960 (per 100,000):		
Alcohol and drug abuse	.302	
Psychosis	.189	
Schizophrenia	.100	
All disorder groups in total	.216	

The correlation is highly significant ($p < .001$; xxx) when $r \geq .520$, significant ($p < .01$; xx) when $r \geq .420$ and almost significant ($p < .05$; x) when $r \geq .332$.

Table 28

**Coefficients of correlation between the 1960–61 suicide rate
and the variables used to describe the research areas (N = 27) in Helsinki**

Variable	Coefficient of correlation	Level of significance
Location of district(s)		
Inner Helsinki – Outer Helsinki	-.548	xx
Distance from centre	-.516	xx
Area of district(s) comprised	-.451	x
Age and sex distribution of population (%)		
Adult population, 15–	.612	xxx
Women	.517	xx
Old people, 65–	.489	xx
Socio-economic status (%)		
Social group I	-.064	
Social group II	-.165	
Social group III	.003	
Social group IV	.264	
Persons who had passed matriculation examination	.084	
Economically active population	-.081	
Industrial workers	-.144	
Social population groups (%)		
Persons living alone	.646	xxx
Subtenants	.420	x
Swedish-speaking	.102	
Mental health variables		
Persons admitted to psychiatric hospital for treatment in 1960 (per 100,000):		
Alcohol and drug abuse	.340	
Psychosis	.455	
Schizophrenia	.478	
All disorder groups in total	.488	x

The correlation is highly significant ($p < .001$; xxx) when $r \geq .597$, significant ($p < .01$; xx) when $r \geq .487$ and almost significant ($p < .05$; x) when $r \geq .381$.

When the corresponding correlations were computed for the division of Helsinki into 27 research areas, the relationships between the suicide rate and the variables used appeared closer (Table 28). The correlations were in the same direction as in the case of 37 research areas but statistically more significant. Two of the correlations, namely, those with the proportion of persons living alone (.646) and the proportion of adult (15-) population (.612) were highly significant. In addition, the suicide rate correlated significantly with the proportion of women (.517) and that of old people (.489). The correlations with the variables indicating the location of the research area were also significant in this case. The correlation with the research area's being located in Inner Helsinki was .548 and that with the distance from the centre of the city was $-.516$. The correlation with the area in hectares of the district(s) concerned was negative and almost significant ($-.451$). In this case almost significant correlations also emerged with the proportion of subtenants (.420) and the rate of admissions to psychiatric hospitals for treatment (.488).

Of the correlations of suicide rates with the other variables, only those of the crude rate (i.e., the rate computed relative to the whole population) are given here, since the correlations obtained for the age-adjusted rates were completely in the same direction. That this was so is comprehensible considering that, in the case of the 37 research areas, the crude rate correlated with the age-adjusted rate (15-) to the extent of .996, with the rate for men by .928 and with that for women by .765. The corresponding correlations in the case of the 27 research areas were .993, .902 and .837 respectively. The correlation that the crude rate bore to the rate for women was slightly lower than the other correlations, but it, too, was highly significant in both cases. The correlations of the rate for women differed from the other corresponding correlations the most notably in that both the correlations with the variables indicating the location of the research area and the correlation with the percentage of adult population were only almost significant. Moreover, the correlation with the percentage of old people failed to be statistically significant.

Explanation of variations in suicide rates by means of stepwise regression analysis

An attempt was made to explain the variations shown by the suicide rates from one research area to another by means of stepwise regression analysis. The suicide rate was the dependent variable to be explained, and the variables describing the characteristics of the population in the various research areas were used as the independent or explanatory variables. Regression analyses were carried out employing both the division of Helsinki into 37 research areas and that into 27 research areas, the variables being the same in both cases. Only the latter analyses will be considered here, however, because of their defi-

nately greater explanatory power. The independent variables chosen for the analyses were variables characterizing the age and sex composition of the population, its socio-economic composition and its psychiatric morbidity. The variable indicating the distance of the research from the centre of the city was not included in the final analysis, as it was considered desirable to seek to estimate the explanatory capacity of the purely demographic variables. The exclusion of this location variable slightly reduced the explanatory power of the model.

The final result yielded by the stepwise regression analysis is presented in Table 29, without showing the intermediate stages. The final model included three variables: 1. the proportion of adults (15—) in the total population, 2. the proportion of men and 3. the proportion of members of social group I. These three variables accounted for 44.6 per cent of the variance of the suicide rate. Interestingly enough, the admission variables indicating the mental health of the population did not significantly raise the degree of explanation.

Table 29

**Explanation of variation in suicide rates between research areas (N = 27)
in Helsinki in 1960—61. Stepwise regression analysis.
Dependent variable: suicide rate (crude)**

Step	Independent variable	Standardized coefficient	t	R ² %*
1.	Adult population, 15—	.360	1.62	37.4
2.	Men	-.403	-1.61	39.7
3.	Social group I	-.268	-1.42	44.6
4.	Abuse of alcohol and drugs			45.0
5.	Admissions to psychiatric hospitals			45.1
6.	Schizophrenia			45.4
7.	Social group IV			45.6

* The square of the coefficient of multiple correlation expressed as a percentage, indicating the explanatory power of the model, or the percentage proportion of the variance of the dependent variable accounted for by the independent variables.

The same independent variables were then used in another stepwise regression analysis, undertaken to explain the age-adjusted suicide rate (15—). Through adjusting the suicide rate for age the variation in the rate due to variations in the age composition of the population was limited. The end result of this analysis is shown in Table 30. In this case, the model included, in addition to the three variables involved in the preceding model, one of the variables employed to describe the mental health of the population, namely, the

Table 30

Explanation of variation in suicide rates between research areas (N = 27)
 in Helsinki in 1960–61. Stepwise regression analysis.
 Dependent variable: age-adjusted rate (15 yr and over)

Step	Independent variable	Standardized coefficient	t	R ² %
1.	Adult population, 15–	.245	.94	27.5
2.	Schizophrenia	.074	.31	30.2
3.	Men	-.378	-1.29	32.1
4.	Social group I	-.248	-1.05	35.3
5.	Social group IV			35.5
6.	Admissions to psychiatric hospitals			35.7
7.	Abuse of alcohol and drugs			35.9

admission rate for schizophrenia. The final model thus came to include one variable indicating the ratio of adults to children in the population, one indicating the sex ratio (men/women), one descriptive of the socio-economic composition of the population (the proportion of persons belonging to social group I) and, finally, one variable indicating the mental health of the population (the schizophrenia admission rate). The last-mentioned variable clearly played the smallest part in the model. These four variables were jointly sufficient to explain 35.3 per cent of the variance of the age-adjusted suicide rate for Helsinki in 1960–61 when the districts of the city were grouped into 27 research areas.

Concluding remarks

In 1960–61 suicides were unevenly distributed between the various parts of Helsinki. In the central parts of the city, and generally in Inner Helsinki, the suicide rates, and the rates for men in particular, were higher than elsewhere, although there were notable variations in suicide rates between the various districts of the City Centre. Suicide rates correlated with the percentage of persons living alone and with that of old people, with the extent to which women outnumbered men, with a small number of children and with the number of psychiatric patients in the population. These observations are interpretable as indicating that suicide rates tend to be high in areas where the proportion of the total population accounted for by members of groups that are poorly integrated with the community is large. It proved in fact possible to

explain a considerable proportion (35 per cent) of the variance of the suicide rate in terms of variables indicating the ratio of children to adults, that of men to women and the frequency of disturbance of mental health in the population.

Suicides in 1970–71

Suicides and suicide rates in Inner and Outer Helsinki

Of the total of 272 suicides recorded in Helsinki in 1970–71, 239, or 87.9 per cent, were committed by persons belonging to the permanent population of the city. The distribution of these 239 suicides between Inner and Outer Helsinki is presented in Table 31.

Half of the total suicides (51.0 per cent) took place in Inner Helsinki. When the two sexes are considered separately, however, an interesting observation can be made: a majority of the suicides committed by men (54.5 per cent) took place in Outer Helsinki while a majority of those committed by women (59.4 per cent) took place in the Inner Helsinki.

The suicide rates for Inner and Outer Helsinki were 28.5 and 20.4 respectively, the ratio between these two being 1.40. When the rates were adjusted for age (15–), however, the ratio fell to 1.22. The difference between Inner and Outer Helsinki was principally due to the rates of women (with whom the Inner Helsinki/Outer Helsinki ratio was 1.59), whereas the rates of men for Inner and Outer Helsinki were only slightly different (the corresponding ratio being 1.08). The sex-linked difference in suicide rates is also reflected by the

Table 31

Suicides and suicide rates in Inner and Outer Helsinki in 1970–71

Variable	Inner Helsinki	Outer Helsinki
Total suicides	122	117
Male suicides	65	78
Female suicides	57	39
Suicide rate, crude	28.5	20.4
Suicide rate, 15–	32.7	26.8
Rate for male population	36.2	29.7
Rate for female population	22.9	12.6
Rate for male population, 15–	43.5	40.3
Rate for female population, 15–	25.5	16.0

fact that the ratio of men's rate to women's rate was only 1.70 in Inner Helsinki but as high as 2.52 in Outer Helsinki.

Suicides in the various Large Areas

The distribution between the nine Large Areas of Helsinki of the suicides committed in 1970–71 is shown in Table 32. The frequency of suicides ranged from a minimum of 13 to maximum of 42, the lowest figures being those for Areas 2 and 5 and the highest the figure for Area 9.

The suicide rate was definitely highest, or 42.1, in Area 1, located at the very centre of the city. The differences between the other large areas were not very marked. In Inner Helsinki, the rate was clearly lowest in Area 4; and, in Outer Helsinki, in Areas 6 and 9.

In Inner Helsinki, the rate of men was high particularly in Area 1 but also in Areas 2 and 3, and in Outer Helsinki it was high in Area 7. On the other hand, relatively low rates for men were recorded in Areas 4 and 5 in Inner Helsinki and in Areas 6 and 9 in Outer Helsinki. The rate for women was low in all the large areas of Outer Helsinki and comparatively high in Areas 1 and 5 in Inner Helsinki.

Table 32

Suicides and suicide rates by Large Areas in Helsinki in 1970–71

Area	Total	Suicides		Crude	Suicide rates		
		Male	Female		15–	Male	Female
1.	35	20	15	42.1	48.4	56.5	31.5
2.	15	9	6	30.2	35.7	41.5	21.4
3.	29	17	12	26.4	30.3	40.2	17.8
4.	30	14	16	20.6	23.2	22.4	19.3
5.	13	5	8	31.8	38.2	28.3	34.4
6.	35	22	13	18.6	23.0	26.6	12.3
7.	20	14	6	27.7	34.7	42.0	15.4
8.	20	14	6	23.3	31.9	34.2	13.3
9.	42	28	14	18.6	25.5	26.5	11.6

Suicides in the 37 Research Areas

There were notable differences in suicide rates between the 37 research areas, comprising one to three districts each (Table 33). The highest, or 81.5,

Table 33

Suicides in Helsinki: frequencies and rates for the 37 research areas in 1970–71

No. of area	Name of area	Suicides	Rate, crude	Rate, 15–
1.	Kruununhaka	10	47.0	54.5
2.	Kluuvi (+3)	5	81.5	96.3
4.	Kamppi	13	40.5	46.0
5.	Punavuori (+20)	7	25.8	29.6
8.	Katajanokka	4	50.8	58.3
11.	Kallio	12	19.1	20.4
12.	Alppiharju	10	24.7	28.8
13.	Etu-Töölö	7	19.3	21.9
14.	Taka-Töölö	13	30.8	35.4
15.	Meilahti	2	13.5	15.7
16.	Ruskeasuo (+17)	6	56.4	67.8
18.	Laakso	1	17.2	19.0
19.	Mustikkamaa (+10)	2	22.2	26.1
21.	Hermanni	1	11.7	13.8
22.	Vallila	5	20.2	24.0
23.	Toukola	2	32.9	39.7
24.	Kumpula	1	15.6	19.8
25.	Käpylä	9	41.0	48.4
26.	Koskela	1	15.4	18.6
28.	Oulunkylä	11	23.8	29.6
29.	Haaga	8	14.4	17.7
30.	Munkkiniemi	11	25.1	30.4
31.	Lauttasaari	7	16.4	20.3
33.	Etelä-Kaarela	6	28.4	35.6
34.	Pakila	8	44.8	57.6
35.	Tuomarinkylä	1	12.4	15.4
36.	Viikki (+37,38)	12	32.4	44.0
39.	Tapaninkylä	4	20.3	26.1
40.	Suutarila	0	0.0	0.0
41.	Suurmetsä	4	18.2	27.2
42.	Kulosaari	1	9.8	12.5
44.	Tammisalo (+43)	16	31.1	39.8
45.	Vartiokylä	12	18.7	25.5
46.	Pitäjänmäki (+32)	3	11.8	15.4
48.	Vartiosaari (+49, 51)	5	22.8	32.0
52.	Suomenlinna (+6,7,9)	11	28.8	34.3
54.	Vuosaari (+47)	8	10.2	14.9

was the rate for Research Area 2, located at the centre of Helsinki and consisting of the Districts of Kluuvi and Kaartinkaupunki. High rates were also recorded for Research Areas 1, 4 and 8, bordering on Research Area 2 and consisting of the Districts of Kruununhaka, Kamppi and Katajanokka. Another area of high suicide rates, located in the northern parts of Inner Helsinki, was made up of Research Areas 16 and 25 (Ruskeasuo, Pasila and Käpylä). In Outer Helsinki, the rates for Research Areas 34 (Pakila) and 36 (Viikki-Pukinmäki-Malmi) were high, and the rate for Research Area 44 (Herttoniemi and Tammisalo) was also clearly higher than the rates for the rest of Outer Helsinki.

In the central parts of the city the areas of high suicide rate were surrounded by a zone of much lower rates, consisting of Research Areas 52 (Suomenlinna, Eira, Ullanlinna and Kaivopuisto), 5 (Länsisatama and Punavuori), 13 (Etu-Töölö), 12 (Alppiharju), 11 (Kallio) and 19 (Sörnäinen-Mustikkamaa). Moreover, north of this zone in Inner Helsinki, in Research Areas 21, 22, 23, 24 and 26 (Hermannin, Vallila, Toukola-Vanhakaupunki, Kumpula and Koskela), the rates were comparatively low. In Outer Helsinki, Research Areas 29 (Haaga), 31 (Lauttasaari), 35 (Tuomarinkylä), 40 (Suutarila), 41 (Suurmetsä), 42 (Kulosaari), 46 (Pitäjänmäki and Konala) and 54 (Mellunkylä and Vuosaari) had low rates. It is interesting that nearly all these areas were situated in the outskirts of Helsinki. The uneven distribution of suicide rates is shown in the map in Appendix 1.

Suicides in the 27 Research Areas

The suicide rates for the 27 research areas varied between 10.2 and 54.7 (Table 34). With regard to their suicide rates these areas can clearly be grouped into larger units. Suicide rates were high in Research Areas 1 and 4, located in the City Centre and in research Areas 16 and 25 in the northern part of Inner Helsinki. In addition, in Outer Helsinki, Research Areas 34 and 36 formed an area where suicides were higher than in the surrounding districts. Areas of low suicide rates were met only in Outer Helsinki. In the western sections, Research Area 31 and Areas 29 and 46 were such. In the eastern parts of Outer Helsinki a zone of low suicide rates consisted of Research Areas 39, 41, 45 and 54. Apart from these high- and low-rate areas, there was a rather extensive, continuous area where suicide rates were only moderately high.

Table 34

Suicides in Helsinki: frequencies and rates for the 27 research areas in 1970-71

No. of area	Name of area	Suicides	Rate, crude	Rate, 15-
1.	Kruununhaka (+ 2,3)	15	54.7	63.8
4.	Kamppi	13	40.5	46.0
5.	Punavuori (+ 20)	7	25.8	29.6
12.	Alppiharju	10	24.7	28.8
13.	Etu-Töölö	7	19.3	21.9
14.	Taka-Töölö	13	30.8	35.4
15.	Meilahti	2	13.5	15.7
16.	Ruskeasuo (+ 17,18)	7	42.6	49.6
19.	Mustikkamaa (+ 10,11)	14	19.5	21.0
22.	Vallila (+ 21)	6	18.1	21.4
25.	Käpylä	9	41.0	48.4
26.	Koskela (+ 23,24)	4	21.1	25.9
28.	Oulunkylä	11	23.8	29.6
29.	Haaga	8	14.4	17.7
30.	Munkkiniemi	11	25.1	30.4
31.	Lauttasaari	7	16.4	20.3
33.	Etelä-Kaarela	6	28.4	35.9
34.	Pakila (+ 35)	9	34.7	44.1
36.	Viikki (+ 37,38)	12	32.4	44.0
39.	Tapaninkylä (+ 40)	4	14.8	19.2
41.	Suurmetsä	4	18.2	27.2
42.	Kulosaari (+ 43,44)	17	27.6	35.3
45.	Vartiokylä	12	18.7	25.5
46.	Pitäjänmäki (+ 32)	3	11.8	15.4
48.	Vartiosaari (+ 49,51)	5	22.8	32.0
52.	Suomenlinna (+ 6,7,8,9)	15	32.6	38.5
54.	Vuosaari (+ 47)	8	10.2	14.9

Correlations of suicide rates with other variables

The correlations of the suicide rate with the variables used to characterize the research areas and their population are set out in Table 35. The correlations were computed both from the observations for the 37 research areas and from those for the 27 research areas. The results were in the same direction in both cases, but the level of significance of the correlations tended to be higher in the former than in the latter case.

The highest correlations were among those with the variables indicating the nature of the district. The suicide rate correlated significantly ($p < .01$) with the shortness of the distance of the district from the centre of the city and with the percentage of persons living in buildings completed before 1960. Thus, the larger the proportion of comparatively recently constructed residential buildings and the longer the distance from the centre of the city, the lower was the suicide rate.

The correlations of the suicide rate with the variables characterizing the age and sex distribution of the population were rather low. The highest among them were those with the percentage of men aged 30 and over (37 observations) and with the percentage of people aged 30 and over (27 observations), both of which were statistically almost significant ($p < .05$). In 1970–71 the extent to which men outnumbered women in the areas concerned did not correlate with the suicide rate significantly.

Of the variables characterizing the socio-economic composition of the population, the percentage of the economically active persons was the one that bore the highest correlation to the suicide rate, but not even this correlation was statistically significant. The percentages of people belonging to social groups I and IV correlated positively and the percentages of those belonging to social groups II and III negatively with suicide rate. These two correlations were far too low, however, to be statistically significant.

The variables indicating the percentages of special population groups in the total population did also not correlate significantly with the suicide rate. The correlations of the variables indicating the percentages of persons living alone, of subtenants and of Swedish-speaking people were positive, whereas the variables indicating the numbers of large households and of those living in crowded conditions correlated negatively with the suicide rate.

As for the variables indicating psychiatric morbidity, only the schizophrenia first-admission index correlated to a statistically significant extent ($p < .05$) with the suicide rate. The correlations of all the other admission rate variables were definitely lower than the correlation of this index.

Table 35

Coefficients of correlation* between the 1970–71 suicide rate and the variables used to describe the research areas (N = 37 and N = 27) in Helsinki

Variable	N = 37		N = 27	
	Coefficient of correlation	Level of significance	Coefficient of correlation	Level of significance
Nature of the district(s)				
Inner Helsinki – Outer Helsinki	–.347	x	–.389	x
Distance from centre	–.487	xx	–.457	x
Area of district(s) comprised (hectares)	.189		–.186	
Persons living in buildings completed in 1960 or later (%)	–.423	xx	–.463	x
Persons living in buildings completed in 1960–64 (%)	–.333	x	–.267	
Persons living in buildings completed in 1965 or later (%)	–.274		–.374	
Persons living in 1-2-dwelling houses, etc. (%)	–.245		–.114	
Age and sex distribution of population (%)				
Adult population, 15–	.268		.359	
Adult population, 30–	.314		.446	x
Old people, 65–	.235		.380	
Men	–.023		–.205	
Men, 15–	.318		.297	
Men, 30–	.357	x	.346	
Women	.023		.205	
Women, 15–	–.219		.280	
Women, 30–	–.216		.371	

Socio-economic status (%)

Social group I	.102	.112
Social group II	-.137	-.074
Social group III	-.180	-.174
Social group IV	.198	.107
Social groups I and II	.050	.072
Economically active population	.211	.268
Industrial workers	-.181	-.192

Special population groups (%)

Persons living alone	.257	.268
Subtenants	.307	.327
Swedish-speaking	.283	.247
Large households	-.144	-.195
Persons living in overcrowded conditions	-.110	-.142

Psychiatric morbidity

Schizophrenia first admission index	.338	x	.479	x
Municipal psychiatric hospital admission index	-.054		.039	
University psychiatric hospital admission rate	.144		.051	
Private psychiatric hospital admission rate	.121		.116	

* In the case of the division into 37 research areas, the coefficient of correlation was highly significant ($p < .001$; xxx) when $r \geq .520$, significant ($p < .01$; xx) when $r \geq .420$ and almost significant ($p < .05$; x) when $r \geq .332$; in the case of the division into 27 research areas, the coefficient of correlation was significant ($p < .01$; xx) when $r \geq .487$ and almost significant ($p < .05$; x) when $r \geq .381$.

Explanation of variations in suicide rates by means of stepwise regression analysis

Stepwise regression analysis was used in an attempt to explain the observed variation in the suicide rate in terms of variables indicating the location of the research area, its degree of regeneration, the proportions of the total population accounted for by people belonging to multi-person households, by those living in crowded housing conditions and by adult males, and in terms of variables indicating the socio-economic composition of the population and the frequency of psychic disturbances in it. The results of this analysis are presented in Table 36. The final regression model included seven variables, which were found to explain 60.6 per cent of the variance of the suicide rate variable. The model included the schizophrenia index, whereas the other three mental health or psychiatric morbidity variables remained — as expected — outside it. Also, the variable indicating the degree of regeneration of the area, i.e., the proportion of persons living in buildings completed in 1960 or later, was not among the variables involved in the model.

Table 36

Explanation of variation in suicide rates between research areas (N = 37) in Helsinki in 1970–71. Stepwise regression analysis.
Dependent variable: suicide rate (crude)

Step	Independent variable	Standard. coeff.	t	R ² %
1.	Distance from centre	-.720	-2.64	23.7
2.	People belonging to multi-person households	.596	2.27	35.6
3.	Schizophrenia first admission index	.236	1.71	40.2
4.	Overcrowded dwelling units	-.264	-1.76	44.9
5.	Men, 15—	.191	1.35	49.1
6.	Social group IV	.686	2.89	51.7
7.	Social group III	-.617	-2.56	60.6
8.	Municipal psychiatric hospital admission index			61.4
9.	University psychiatric hospital admission rate			62.1
10.	Private psychiatric hospital admission rate			62.8
11.	Persons living in buildings completed in 1960 or later			63.2

When the same variables were used to explain the variations observed in the suicide rate of men, the result yielded by stepwise regression analysis did not differ greatly from that of the above analysis. This time the model was found to explain only 47.0 per cent of the variance, however; and instead of the schizophrenia first-admission index the model now included the municipal psychiatric hospital admission rate.

The percentage of the variation of the suicide rate for women accounted for by the same variables was somewhat smaller still. In this case the final regression model included four variables: the distance from the centre, schizophrenia, social group IV and social group III variables. These four variables explained 39.5 per cent of the variance of the dependent variable. The distance from the centre alone explained 19.3 per cent of the variance of the rate for women but only 11.5 percent of that of the rate for men. The percentage of people belonging to multi-person households, which explained 20.2 per cent of the variance in the case of men, did not enter into the model for women at all.

The same variables were also employed to explain the suicide rate making use of the division of Helsinki into 27 research areas. This time the regression model, presented in Table 37, came to include only three variables: the schizo-

Table 37

**Explanation of variation in suicide rates between research areas (N = 27)
in Helsinki in 1970–71. Stepwise regression analysis.
Dependent variable: suicide rate (crude)**

Step	Independent variable	Standard. coeff.	t	R ² %
1.	Schizophrenia first admission index	.408	2.56	.230
2.	Distance from centre	-.496	-2.91	.330
3.	Overcrowded dwelling units	-.430	-2.61	.483
4.	People belonging to multi-person households			.514
5.	Social group IV			.537
6.	Social group III			.565
7.	Municipal psychiatric hospital admission index			.584
8.	University psychiatric hospital admission rate			.589
9.	People living in buildings completed in 1960 or later			.598
10.	Private psychiatric hospital admission rate			.605
11.	Men, 15–			.607

phrenia first-admission rate, distance from the centre and the number of overcrowded dwelling units relative to the population of the area. These three variables accounted for 48.3 per cent of the variance. Not one of the remaining seven variables obtained a regression coefficient significantly different from zero, despite the fact that their inclusion raised the percentage of the variance explained by the model to 60.7.

Finally, the explanatory power of the demographic variables alone was examined, excluding from the analysis, i.a., the distance from the centre variable, which had proved important in the preceding models. Employing the variables indicating the age and sex distribution, the socio-economic composition and the mental health of the population a regression model involving four variables was arrived at: the schizophrenia first-admission index, social group I, social group IV and the percentage of adult males in the population. These four variables explained a total of 38.1 per cent of the variance of the suicide rate for the 27 research areas. When the same variables were used to explain the age-adjusted rate (15—), only the first three of these four variables remained in the model, and they explained 27.3 per cent of the variance of the dependent variable.

Concluding remarks

As in 1960–61, suicides were unevenly distributed between the various parts of Helsinki in 1970–71. Suicide rates for the population taken as a whole and particularly those for women, were clearly highest in the central parts of the city; in the case of men, by contrast, the difference between Inner Helsinki, or the main city areas, and suburban Outer Helsinki was rather small. In the central parts of the city, high rates were met in the City Centre proper, whereas there were residential districts rather close to it where the suicide rates were comparatively low. Farther away from the centre, mainly in the north, there were also suburban areas where the rates were relatively high.

There was a tendency for the suicide rates to be high in the central parts of the city and in its old districts. On the other hand, significantly lower rates were recorded for the regenerating or young suburban areas. As for the other variables considered, the frequency of psychic disturbances and the proportion of adults in the total population of the district correlated with the suicide rate.

The variables used were sufficient to explain about half the variance of the suicide rate, which result must be considered rather satisfactory. Regarding the explanatory variables employed it should further be stated that, of the variables indicating the socio-economic composition of the population, the percentage of persons belonging to social group IV was related to a high and that of persons belonging to social group III to a low suicide rate. Also, the low frequency of overcrowded dwelling units contributed significantly to the ex-

planation of low suicide rates.

The variables indicating the location of the area relative to the centre of the city, the character of the area, and the socio-economic composition, living conditions and mental health of its population were found to explain the observed variation in the rate of suicide to a significant extent.

Changes from 1960–61 to 1970–71

Changes in the total frequencies and in the rates for the whole population

In 1960–61 a total of 276 suicides and, in 1970–71, a total of 272 suicides were committed in Helsinki. Thus, in terms of absolute frequencies, the suicide problem did not change much over the decade in question. In actual fact, however, remarkable changes in the frequencies of occurrence of suicide took place between these two periods of observation.

Changes in the frequencies and rates of suicide between 1960–61 and 1970–71, both as absolute differences and in terms of percentages, are presented in Table 38.

Table 38

Changes in frequencies and rates of suicide in Helsinki between 1960–61 and 1970–71

Variable	Change	Change %
Total suicides	-4	-1.4
Male suicides	-4	-2.3
Female suicides	0	0.0
Suicide rate, crude	-3.8	-12.6
Suicide rate, 15–	-6.4	-16.3
Suicide rate, male population	-6.2	-14.3
Suicide rate, female population	-2.1	-10.5

In 1970–71 the overall (crude) suicide rate was less by 3.8 (per 100,000 population per year), or by 12.6 per cent, than it had been a decade earlier. The corresponding figures for the age-adjusted rate (15–) were minus 6.4 and minus 16.3 per cent. The rate of men declined somewhat more than that for women: the former fell by 14 per cent and the latter by 10 per cent.

The suicides committed by persons belonging to the "non-permanent" population in 1960-61 and 1970-71

A vast majority of the population of Helsinki belongs to what will here be called "permanent population", i.e., the population occupying dwelling units on a permanent basis. The rest is made up of persons without a dwelling, of the inmates of various institutions and of people residing temporarily outside Helsinki.

According to the 1960 general census of population the group of those "without a permanent dwelling" comprised 7,410 persons, or 1.64 per cent of the population of Helsinki. According to the 1970 census the corresponding group included 7,617 persons, or 1.49 per cent of the population. In addition, in 1970 the "no information" group comprised 1,928 persons, or 0.38 per cent of the population.

Though small in size, the group "without a permanent dwelling" forms a definite risk group with respect to suicide. Figures on the suicides committed by persons belonging to this group in 1960-61 and 1970-71 and on changes in these suicides are given in Table 39. In 1960-61 the suicides belonging to this group numbered 53 and in 1970-71, they numbered 33, accounting respectively for 19 per cent and 12 per cent of the total suicides. In 1960-61 the suicide rate for this group was 358 and in 1970-71 it was 219, or respectively 13 and 9 times the rate for the "permanent population".

Table 39

Suicides in the group of persons "without a permanent dwelling" in Helsinki in 1960-61 and 1970-71

Variable	1960-61	1970-71	Change
Total suicides	53	33	-37.7%
Male suicides	44	27	-38.6%
Female suicides	9	6	-33.3%
Proportion of all suicides accounted for by this group, %	19.2	12.1	-7.1
Proportion of all male suicides accounted for by this group, %	25.3	15.9	-9.6
Proportion of all female suicides accounted for by this group, %	8.8	5.9	-2.9
Ratio of male suicides to female suicides	4.9	4.5	-8.2%
Suicide rate	358	217	-39.4%
Suicide rate, male population	522	299	-42.7%
Suicide rate, female population	141	97	-31.2%
Suicide rate, 15-	464	252	-45.7%

By far the largest part of the suicides in this group are suicides committed by men. While the ratio of suicides committed by men to those committed by women was 1.3 in the permanent population in 1960–61, it was equal to 4.9 in this group. In 1970–71 the corresponding figures were 1.5 and 4.5 respectively. Nevertheless, the rate for women in this group was also many times the rate for women in the permanent population during both two-year periods, though the difference was not quite so marked as in the case of men.

Despite the fact that the suicide rate for this population group was quite high even in 1970–71, it had fallen statistically significantly from the years 1960–61. The frequency of suicides diminished in this group by 38 per cent and the suicide rate for it declined by 39 per cent. Had the suicide rate for this group stayed at its 1960–61 level, the expected value of the number of suicides for 1970–71 would have been 60. Yet the suicides committed in these two years by members of this group did not total more than 33. The decline in comparison with the expected value meant a fall by 2.6 in the overall suicide rate for the population of Helsinki. This finding accounts for a considerable part of the decline in the suicide rate for Helsinki from 30.5 in 1960–61 to 26.6 in 1970–71. The fall in the suicide rate for the group of persons without a permanent dwelling explains 68 per cent of the fall in the overall rate for Helsinki.

Changes in suicide rates for the permanent population in various parts of Helsinki

One of the most remarkable changes that took place in the occurrence of suicides in Helsinki between 1960–61 and 1970–71 was a "shift" of suicides from Inner Helsinki toward Outer Helsinki. Figures illustrating changes in the frequencies and rates of suicide in Inner and Outer Helsinki between 1960–61 and 1970–71 are given in Table 40. The absolute frequencies changed markedly over the decade in question: in Inner Helsinki the number of suicides fell by 29 per cent but in Outer Helsinki it rose by 125 per cent. As for the (crude) suicide rate, it fell in Inner Helsinki by 3.8 and rose in Outer Helsinki by 6.0. The age-adjusted rate, again, fell by 6.8, or by 17.2 per cent, in Inner Helsinki, and rose by 6.6, or by 32.6 per cent, in Outer Helsinki. Thus it is actually justifiable to maintain that there was a tendency for suicides to "shift" from the main city areas of Inner Helsinki toward the suburban areas of Outer Helsinki.

A separate examination of the rates for the two sexes reveals that the change was due mainly to men. The rate of men fell in Inner Helsinki by 21 per cent and rose in Outer Helsinki by 77 per cent; in the case of women, by contrast, the changes were slight: in Inner Helsinki a rise of 2.0 per cent and in Outer Helsinki one of 1.5 per cent.

Table 40

**Changes in frequencies and rates of suicide in Inner Helsinki
and Outer Helsinki between 1960–61 and 1970–71**

Variable	Inner Helsinki		Outer Helsinki	
	Change	Change %	Change	Change %
Total suicides	-49	-28.6	+65	+125.0
Male suicides	-37	-36.3	+50	+178.6
Female suicides	-12	-17.4	+15	+62.5
Suicide rate, crude	-3.8	-11.9	+6.0	+41.8
Suicide rate, 15–	-6.8	-17.2	+6.6	+32.6
Suicide rate, male	-9.7	-21.2	+13.0	+77.4
Suicide rate, female	+0.4	+2.0	+0.2	+1.5

- In table 41 the changes have been considered by the nine main divisions or Large Areas of Helsinki. The changes are notable. In Area 1, at the very centre of the city, the suicide rate had risen by 35 per cent. In Area 2 it had not altered. By contrast, the rate for Area 3 had fallen by 14 per cent. Yet the most remarkable change that had taken place in Inner Helsinki had to do with Area 4: in 1960–61 this area was among the sections of the city characterized by high suicide rates, whereas in 1970–71 it belonged to the group of low-rate

Table 41

**Changes in suicide rates in Helsinki between 1960–61 and 1970–71,
by Large Areas**

Area	Suicide rate in 1960–61	Change in rate	Percentage change	Change in age-adjusted rate (15–)
1.	31.2	+ 10.9	+ 35.0	+ 28.7
2.	30.2	- 0.0	- 0.1	- 3.1
3.	30.8	- 4.3	- 14.1	- 18.5
4.	42.4	-21.7	- 51.3	- 55.1
5.	8.0	+23.7	+295.3	+260.2
6.	16.2	+ 2.3	+ 14.2	+ 4.3
7.	6.8	+21.0	+310.4	+245.4
8.	21.9	+ 1.4	+ 6.4	+ 5.2
9.	11.7	+ 6.8	+ 58.3	+ 50.4

areas. The suicide rate for this area had fallen by as much as 21.7, or by 51.3 per cent. In Area 5, situated north of Area 4, the change had been in the opposite direction: both the frequency of suicides and the suicide rate had grown many times over. In 1960–61 the rate for the area was exceptionally low, or 8.0; ten years later it was fourfold.

The suicide rates for all four large areas in Outer Helsinki had risen. Most surprisingly, the rates for Outer Helsinki, too, had risen the most markedly in those large areas where they had been the lowest in 1960–61. In Area 7 the rate had grown threefold, and in Area 9 it had risen by 58 per cent. In Areas 6 and 8 the rise had been slight.

In Table 42 the changes that took place in the suicide rates between 1960–61 and 1970–71 have been considered in greater detail by the 27 research areas. These research areas have been arranged in the table according to their 1960–61 rates of suicide in increasing order. The figures clearly reveal the rather unexpected finding already referred to: in the areas where the suicide rates were low in 1960–61 they tended to be high in 1970–71, and vice versa. The largest decreases took place in certain western parts of Inner Helsinki (in Research Areas 13 and 15) and in certain parts of Area 4 (in Research Areas 19 and 22). The suicide rate had risen remarkably in the northern parts of Helsinki (in Research Areas 25, 34, 28 and 33) and in the eastern parts of the city bordering on these (Research Area 42). The rate for the core of the City Centre (Research Area 1) had also risen clearly. (See map in Appendix 1).

Correlations of changes in suicide rates with the simultaneous demographic changes are given in Table 43. Not one of these correlations was high enough to be statistically significant. On the other hand, the correlations of these changes with the suicide rates for 1960–61 and 1970–71 were highly significant. The rate for 1960–61 bore a strong negative correlation to the change. This was an indication of the finding, already presented, that in those parts of Helsinki where the rate was low in 1960–61 it had risen and in those parts where it was high in 1960–61 it had fallen. In those sections of the city where the rate had risen markedly, the schizophrenia first-admission index was also high (the coefficient of correlation, .519; $p < .01$) and the number of overcrowded dwelling units in the area was relatively low ($-.384$; $p < .05$).

Table 42

**Changes in suicide rates in Helsinki between 1960–61 and 1970–71,
by research areas (N = 27)**

No. of area	Suicide rate in 1960–61	Suicide rate in 1970–71	Change in rate	Percentage change
25.	3.6	41.0	+ 37.4	+ 1025
34.	4.1	34.7	+ 30.6	+ 747
28.	8.6	23.8	+ 15.2	+ 176
42.	10.2	27.6	+ 17.4	+ 171
33.	10.3	28.4	+ 18.0	+ 174
46.	11.2	11.8	+ 0.5	+ 5
48.	12.6	22.8	+ 10.2	+ 81
39.	13.2	14.8	+ 1.7	+ 13
26.	13.4	21.1	+ 7.7	+ 57
31.	13.6	16.4	+ 2.9	+ 21
45.	15.6	18.7	+ 3.1	+ 20
29.	16.3	14.4	- 1.9	- 12
36.	17.5	32.4	+ 14.9	+ 85
54.	18.0	10.2	- 7.8	- 43
14.	20.0	30.8	+ 10.9	+ 54
30.	23.2	25.1	+ 2.0	+ 8
5.	25.2	25.8	+ 0.6	+ 2
52.	28.6	32.6	+ 4.0	+ 14
16.	28.9	42.6	+ 13.7	+ 47
4.	31.7	40.5	+ 8.8	+ 28
12.	33.2	24.7	- 8.5	- 26
1.	37.8	54.7	+ 17.0	+ 45
13.	40.0	19.3	- 20.7	- 52
15.	40.8	13.5	- 27.3	- 67
22.	43.0	18.1	- 24.9	- 58
19.	46.6	19.5	- 27.1	- 58
41.	48.0	18.2	- 29.8	- 62

Table 43

**Correlations of changes in suicide rate between 1960–61 and 1970–71
with variables characterizing the research areas (N = 27)
and with changes in these variables**

Variable	Correlation	Level of significance
Suicide rate in 1960–61	-.782	xxx
Suicide rate in 1970–71	.632	xxx
Schizophrenia first admission index, 1970	.519	xx
Overcrowded dwelling units	-.384	x
Change in percentage of adult population (15–)	.329	
Change in percentage of economically active population	-.293	
Change in percentage of persons living alone	-.194	
Change in percentage of old people (65–)	.153	
Change in population, %	-.114	
Change in percentage of Swedish-speaking persons	-.104	
Change in percentage of persons belonging to social group II	.099	
Change in percentage of persons belonging to social group IV	.074	
Change in percentage of industrial workers	.089	
Change in percentage of persons belonging to social group I	-.026	
Change in percentage of persons belonging to social group III	-.018	
Change in percentage of male population	.010	
Change in percentage of female population	-.010	

Suicide rates and the changes in them in the thirds of the total population formed on the basis of the research areas

It has been shown in this section that the suicide rate had risen in those parts of Helsinki where it had earlier been low and declined in those parts where it had previously been high. Thus, a sort of levelling-down of the extremes had taken place. In order to measure the change, the rates of suicide in the various thirds of the population were recorded during both research periods (Table 44).

Table 44

**Suicides in Helsinki in 1960–61 and 1970–71: frequencies and rates
for sections of the city obtained by arranging the research areas (H = 27)
according to suicide rate and combining them into three groups having the
same number of inhabitants each**

Section	Number of areas	Population	Suicides	Suicide rate
1960–61				
Lower third	11	142,747	29	10.2
Middle third	9	161,347	77	23.9
Upper third	7	141,273	117	41.4
Total	27	445,367	223	25.0
1970–71				
Lower third	8	149,565	42	14.0
Middle third	8	171,749	74	21.5
Upper third	11	179,493	123	34.3
Total	27	500,807	239	23.9

When the research areas (N = 27) were combined on the basis of the suicide rates into thirds with an approximately equal population each, the suicide rate in 1960–61 for the lower third was found to be 10.2, the rate for the upper third being 41.4. This notably large difference was statistically highly significant ($p < .001$). The middle third also differed to a statistically significant extent ($p < .01$) from both the upper and the lower third (Table 45).

By 1970–71 the difference in the suicide rate between the lower third (14.0) and the upper third (34.3) had clearly diminished. Nevertheless, the difference was still statistically significant. The differences between suicide rates had diminished to such an extent, however, that the difference between the lower and middle thirds was not statistically significant any longer and that the difference between it and the upper third, too, was only almost significant ($p < .05$).

The suicide rate for the permanent population fell over the decade in question from 25.0 to 23.9. The fall was particularly notable in the upper third (from 41.4 to 34.3). On the other hand, the rate for the lower third rose from 10.0 to 14.0. Though these changes were relatively clear-cut, not one of them was large enough to be statistically significant.

The above considerations show that the suicide rates for the various parts of Helsinki clearly levelled off over the ten-year period concerned. Never-

theless, notable differences are still met between the various parts of the city in the rates of suicide.

Table 45

Significance of the differences in suicide rates between the thirds of the population of Helsinki formed on the basis of the level of the suicide rates in 1960–61 and 1970–71 (t test)¹⁾

1960–61	Lower third	Middle third	Upper third	Total
Lower third	—			
Middle third	2.86**	—		
Upper third	5.19***	2.69**	—	
Total	3.34***	0.26	3.15**	—
1970–71	Lower third	Middle third	Upper third	Total
Lower third	—			
Middle third	1.58	—		
Upper third	3.65***	2.25*	—	
Total	2.27*	0.54	2.32*	—
1970–71	1960–61			
Lower third	Lower third	Middle third	Upper third	Total
Lower third	0.95			
Middle third		0.44		
Upper third			1.04	
Total				0.37

¹⁾ * = almost significant (p < .05)
 ** = significant (p < .01)
 *** = highly significant (p < .001)

Explanation of changes in the suicide rates by means of stepwise regression analysis

Stepwise regression analysis was used to examine the extent to which the changes that had taken place in the suicide rate between 1960–61 and 1970–71 could be explained in terms of simultaneous demographic changes. In this analysis use was made of the division of Helsinki into 27 research areas.

An attempt was made to explain the changes in the suicide rate in terms of eight demographic variables indicating changes in the following: the percentages of adults (or children), of old people, of persons belonging to social groups II and IV, of industrial workers and of persons living alone and the total population. The variables employed and the results of the stepwise regression analysis are apparent from Table 46.

Table 46

Explanation of changes in suicide rate in the 27 research areas in Helsinki between 1960–61 and 1970–71. Stepwise regression analysis.
Dependent variable: change in suicide rate (crude)
between 1960–61 and 1970–71

Step	Independent variable	Standardized coefficient	t	R ² %
1.	Change in percentage of adult population (15—)	.510	2.40	10.8
2.	Change in percentage of persons living alone	-.677	-3.46	25.5
3.	Change in percentage of persons belonging to social group II	1.042	2.95	34.1
4.	Change in percentage of industrial workers	.622	2.49	42.9
5.	Change in percentage of persons belonging to social group IV	.552	1.70	49.8
6.	Change in percentage of men			53.3
7.	Change in percentage of old people (65—)			55.8
8.	Change in population, %			57.2

The final regression model included five variables: the percentages of adult population, of those living alone, of the persons belonging to social group II, of industrial workers and of the persons belonging to social group IV. These variables explained 49.8 per cent of the variance of the changes in the rate of suicide. The proportion of the variance accounted for by all the variables used was 57.3 per cent. The model explained the variation in the age-adjusted suicide rate equally well, its explanatory power being in this case 50.2 per cent.

It would thus seem that, where the suicide rate had declined, this decline had been related to demographic changes such as an increase in the percentage of children in the total population, a fall in the percentage of persons belonging to social groups II and IV (or a rise in the percentage of those belonging to social groups I and III) and a decline in the percentage of industrial workers. A rise in the suicide rate was related of course to changes in the opposite direction. That a rise in the proportion of persons living alone was associated with a decline in the suicide rate was an observation opposite to expectations and one that appears difficult of interpretation.

Concluding remarks

A comparison of the figures for 1960–61 and 1970–71 reveals that definite changes had taken place during the intervening ten-year period. Though the total number of suicides remained the same, the suicide rate declined by 16 per cent.

The frequency of suicides committed by persons belonging to the "Non-permanent" population had declined particularly clearly. The absolute number of these suicides diminished by 38 per cent, the decline in the corresponding suicide rate being 39 per cent. In 1960–61 the suicides committed by the non-permanent population accounted for 19 per cent of the total suicides committed in Helsinki, while in 1970–71 the corresponding figure was only 12 per cent. Nevertheless, this population group still constituted a notable suicide risk group.

In 1960–61 the suicides committed by persons belonging to the permanent population were distributed far more unevenly between the various parts of the city than a decade later. By the beginning of the 1970s a notable shift had taken place in suicides from the centre of the city toward its peripheral parts. This was particularly the case with the suicides committed by men. Thus, in 1970–71 there was no longer much difference in the suicide rates for men between Inner and Outer Helsinki. In the case of women, by contrast, suicides were still clearly most frequent in the centre of the city.

It is noteworthy that the suicide rates had fallen most in areas where they had previously been high and, on the other hand, risen in areas where they had previously been low. Thus the differences between the rates for various parts of Helsinki had diminished remarkably between 1960–61 and 1970–71.

In a few areas of the city truly marked changes had taken place in suicide rates. For example, Large Area 4 – or Eastern Inner Helsinki, comprising the Districts of Sörnäinen, Kallio, Alppiharju, Mustikkamaa, Hermanni and Vallila – was clearly a problem area in respect of suicide in 1960–61, the suicide rate for men being particularly high in it. Ten years later the situation was a reversed one: suicide rates in this area were low and distinctly at variance with those for the rest of Inner Helsinki. On the other hand, in Large Areas 5 and

7, north of this area, development had been in the opposite direction: these areas where suicide rates had formerly been low had become high-rate areas.

In certain parts of Helsinki the suicide rates had not changed greatly. In the very centre of the city, where the rate was already high in 1960–61, it had risen further. On the other hand, there were stable low-rate areas, comprising such suburban districts as Haaga, Lauttasaari, Pitäjänmäki, Vartiokylä and Mellunkylä-Vuosaari.

In 1960–61, when there was more variation in the suicide rate, its correlations with the variables used to characterize the areas and their populations were also more distinct. The suicide rate then correlated significantly with the percentages of persons living alone, of adults, of women, of old people and of subtenants. It also correlated positively with the psychiatric hospital admission rate for the area and negatively with the distance at which the area was located from the centre of the city. In 1970–71 the corresponding correlations were in the same direction but lower in significance.

It proved possible to explain the variation in the suicide rate to a rather satisfactory extent in terms of variables characterizing the research areas and their populations. Thus, the age and sex distribution of the population, its socio-economic composition and the location of the area relative to the centre of the city explained some 30 to 60 per cent of the variation in the suicide rate both in 1960–61 and 1970–71. Likewise, variables indicating demographic changes were able to explain about half of the variation in the change in the suicide rate from 1960–61 to 1970–71.

Despite the fact that in 1970–71 the total number of suicides did not differ notably from the corresponding total for the years 1960–61, even quite marked changes took place in this respect in various parts and districts of the city over the ten-year period concerned. These changes were quite strongly connected, it would seem, with the changes that occurred simultaneously in the districts concerned and in their population. During both two-year periods a certain basic profile is perceptible in terms of which the level of the suicide rate can be accounted for. Suicides are more frequent in the central parts of the city than in its suburban sections; they are more frequent among men than among women; and they are more frequent among the non-permanent than the permanent population; and they tend to be frequent in areas characterized by the following: a high percentage of people belonging to the lowest social group, a low percentage of children, a high percentage of old people, a high percentage of people living alone and a high percentage of persons afflicted by comparatively grave psychic disorders.

High and Low Risk Areas

Identification and characterization of high-risk and low-risk areas in Helsinki in 1970–71

With a view to continuing the analysis of the dependence of the frequency of suicide on social environment in the case of the period 1970–71 an effort was made to reduce the considerably large number of variables by means of factor analysis. The goal was to describe the various districts of Helsinki in terms of a comparatively small number of factors thus obtained.

This factor analysis was also meant as a preparatory stage for grouping analysis, which was intended to be used to classify the district into more comprehensive district groups, inwardly as homogeneous as possible with respect to certain background variables. The grouping was not to be based on the original variables but on the factor scores obtained by the various districts on the factors to be formed.

Factor analysis of 48 variables used to describe the 37 research areas in Helsinki in 1970

During the first stage an effort was made to characterize the 37 research areas in terms of a small number of factors to be extracted from the 48 variables listed in Appendix 2. Employing the principal axis method, the following eigenvalues were obtained for eight factors: 16.76, 7.66, 3.99, 3.05, 3.01, 2.00, 1.28 and 1.05. Of the varimax solutions (including 4 to 8 factors) the four-factor solution was chosen on the basis of the eigenvalues and the interpretability of the factors (see Appendix 2).

Factor I

The numerically highest loadings of Factor I were as follows.

Variable	Loading
292. People belonging to multi-person households	-.950
306. Women, 15- . . . . .	.932
287. Persons living alone . . . . .	.917
307. Women, 30- . . . . .	.904
2. Inner Helsinki - Outer Helsinki	-.890
272. Population, 15- . . . . .	.888
276. Old people, 65- . . . . .	.876
1. Large area (distance from centre)	-.871

274.	Population, 30—	.863
304.	Women	.847
294.	Persons living in buildings completed in 1960 or later	-.752
295.	Persons living in buildings completed in 1965 or later	-.697
234.	Area of district (hectares)	-.662
293.	Persons living in 1—2-dwelling buildings and terrace or row houses	-.649

This can be characterized as a "disintegration" factor. Typical of it is that the variables which obtained the highest loadings can be interpreted as symptoms of an undesirable kind of urban growth, the distinctive features of which are changes in the central areas of the city interpretable as disintegrative. It reflects phenomena such as a high frequency of people without families (292) and people living alone (287); a large proportion of women in the population (306, 307, 304); the fact that the older age groups tend to be over-represented in the population (272, 276, 274). These phenomena are connected with the central parts of the city (2, 1), rather than with its new suburban areas, where there is space (234), single-family houses and other comparable types of dwelling (293) and new buildings as a sign of the growth of the city (294, 295).

Several of the variables had their highest loadings on this factor.

Factor II

The numerically highest loadings of Factor II were as follows.

Variable	Loading	
290.	Industrial workers	-.927
308.	Social groups I and II	.923
277.	Social group I	.903
279.	Social group III	-.896
280.	Social group IV	-.793
281.	Swedish-speaking persons	.704
278.	Social group II	.670
291.	Overcrowded dwelling units	-.617
283.	Private psychiatric hospital admission rate	.438

This can be called a "well-being" factor, as the variables in which it obtained its highest loadings reflect socio-economic well-being (308, 277, 670, 283) and, on the other hand, the absence of socio-economic problems (290, 279, 280, 291). The prominent presence of the Swedish-speaking section of the population also apparently has connections with an area's high socio-economic level (281). Of the variables indicating the mental health of the population, admissions to private psychiatric hospital are associated with this well-being factor.

Factor III

The numerically highest loadings were here as follows.

Variable	Loading
350. Change in the percentage of women, 1960 to 1970 . . . . .	.882
313. Change in the percentage of old people (65-), 1960 to 1970 . . . . .	.680
278. Social group II . . . . .	.515
280. Social group IV	-.410
319. Change in the percentage of economically active persons, 1960 to 1970	-.467
203. Population . . . . .	.423
288. Households of over 5 persons	-.404

This factor may be characterized by naming it "demographic change I: growth in the passive sections of the population". It is not very easy to form a distinct idea of this factor through interpretation. Nevertheless, a feature common to the variables on which it obtained high loadings was a change in the population in a passive direction. Over the ten-year period concerned, the ratio of men to women has diminished (350), the proportion of old people had increased (313) and the proportion of economically active persons had declined (319). At the same time, the frequency of large households, i.e., families with children, had diminished (288). Moreover, the number of inhabitants (203) is large and members of the middle class form a considerable proportion of the population (278), whereas the proportion of members of the lowest social group is small (280).

There was a degree of overlap between this factor and Factor I and, also, Factor II to some extent. The central features of the demographic change described by this factor were a rise in the ratio of men to women and a decline in the percentage of old people over the ten-year period concerned.

Factor IV

The numerically highest loadings of Factor IV were as follows.

Variable	Loading
349. Percentage change in population, 1970/1960	-.701
273. Men, 15- . . . . .	.683
312. Change in the percentage of adults (15-), 1960 to 1970 . . . . .	.656
275. Men, 30- . . . . .	.649
317. Social group IV, change in percentage, 1960 to 1970 . . . . .	.645
295. Persons living in buildings completed in 1965 or later	-.572

294.	Persons living in buildings completed in 1960 or later	-500
314.	Social group I, change in percentage, 1960 to 1970	-470
313.	Old people (65-), change in percentage, 1960 to 1970 . . . . .	.465
234.	Area of district (hectares)	-464
282.	Schizophrenia first-admission index . . . . .	.405

Factor IV will be referred to as "demographic change II: increases in the percentages of men, of old people and of members of the lowest social group associated with a decline in the population of the old districts of the city". The change has been in the direction of slum formation, although interpreting this factor as a "slum formation" factor may involve a bit of exaggeration. The central variables are the decline in the population (349) and an increase in the percentage of adults (312), especially adult males (273, 275), simultaneously with a decline in the socio-economic level of the population (317, 314). These changes have occurred in districts whose land area is small (234) and where there are not many new residential buildings (294, 295). It is of some interest that this "slum-formation factor" also involves an increase in the percentage of old people (313) and a high value of the schizophrenia first-admission index for 1970 (282). The factor may be considered to describe the concentration of psychosocial problems caused by the out-migration of the elements of the population characterized by "vitality", well-being and "health" from certain old residential districts.

To sum up, the 48 variables were capable of being reduced to four factors describing the research areas. A central position among the factors was occupied by a "disintegration - integration" dimension. The other three factors were indications of well-being, demographic change amounting to an increase in the economically non-active population and "slum-formation".

The four factors accounted for over 50 per cent of the variance of 48 variables. Their explanatory power was lowest in the case of the mental health variables: of the variance of these variables these factors only explained 10 to 21 per cent.

Grouping analysis

Grouping analysis is a multivariate technique, an application of cluster analysis, by means of which the observation units can be divided into a given number of inwardly homogeneous groups. The within variance of the group with respect to specified variables is used as the measure of its homogeneity. In practice, a grouping analysis cannot be carried out except through automatic data processing techniques. Even so, the identification of a definitely optimal grouping is computationally laborious. Thus it was also here necessary to be content with an iterative method of solution, which could not ensure the attain-

ment of an absolute optimum. As the method is a new one, its use is not yet very widespread. The theoretical background of the method and the iterative algorithm employed have been described, e.g., by Sarna & al. (1977).

In this study the variables used to describe the observation units (the districts of Helsinki or the research areas) were first reduced into a smaller number of factors. For each unit the factor scores on these factors were estimated, and in the grouping analysis an effort was made to classify the observation units into the specified number of groups inwardly as homogeneous as possible. For the purposes of the analysis, the factor scores were standardized, so that the mean of the factor scores for the observation units was zero, the standard deviation being equal to one.

Classification of the 37 research areas into two groups

Table 48 presents the results of the grouping analysis designed to divide the 37 research areas into two inwardly homogeneous groups in terms of the four factors extracted from the 48 variables.

Table 48

Grouping analysis. Classification of the 37 research areas into two groups in terms of the four factors derived from the 48 variables

Group	Factor I		Factor II		Factor III		Factor IV	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1.	-.951	.426	.261	.960	.157	.751	-.680	1.199
2.	.808	.473	-.222	.954	-.134	1.132	.578	.756

Research areas included in the groups

Group 1: 28,29,30,31,33,34,35,36,39,40,41,42,44,45,46,48,54

Group 2: 1,2,4,5,8,11,12,13,14,15,16,18,19,21,22,23,24,25,26,52

It is interesting to note that this analysis yielded a result precisely identical with the official division of the area of Helsinki into the main city area, or Inner Helsinki, and the suburban districts, or Outer Helsinki. This division was also involved in the analysis as one of the variables included in it (variable 2).

These two groups differed from each other the most clearly with respect to factor I (Disintegration), which obtained a positive value in Inner Helsinki and a negative value in Outer Helsinki. Factor IV (Increases in the percentages of men, old people and members of the lowest social group in the old city districts, attendant upon a decline in the number of inhabitants) also had a

positive value in Inner Helsinki and a negative value in Outer Helsinki. Group I, or suburban Outer Helsinki, obtained low positive scores on Factors II (well-being) and III (demographic change I: growth in the passive sections of the population). The standard deviations of these factors were large, however, and thus the scores for Inner and Outer Helsinki on them showed a great deal of overlap.

The suicide rate for the area covered by Group I was 20.4, the corresponding figure for Group II being 28.5.

Classification of the 37 research areas into five groups

The grouping analysis was continued by dividing the observation units (research areas) on the basis of the factor scores into three, four and five groups, inwardly as homogeneous as possible in terms of the variables used.

When the research areas were divided into three groups, a grouping of districts was already obtained for which the suicide rate, 18.3, was clearly lower than the average for whole Helsinki. This low suicide risk area included the Research Areas 26, 36, 41, 45, 48 and 54. Despite the fact that the suicide rate for this group clearly differed from the overall rate for Helsinki – which was 23.9 – the difference was not yet statistically significant.

For the second group obtained at this stage the suicide rate was 22.8. All the other districts then formed a third, large group. In the next phase of the analysis (four groups) this third group was divided into two.

The results of the division of the research areas into five groups are presented in Tables 49 and 50. In the low-risk group already described, Research Area 26 came to form a group on its own (Group 2). Research Area 40 was included in the low-risk group, and the suicide rate for this group (Group 3) declined to 17.8. Groups 1 and 5, in which the suicide rates were 21.2 and 22.8 respectively, already came into being during the second and third stages of the analysis. At this stage of the analysis, Group 4, for which the suicide rate was 31.0, was the high-risk group. Though the difference in the suicide rate between the low-risk and high-risk groups was clear-cut, it was statistically only almost significant ($t = 2.24$).

A comparison of the means of the factor scores for the high-risk areas (Group 4) and low-risk areas (Group 3) in Table 49 reveals that these groups of districts differed from each other very clearly as regards Factor IV. Typical of the high-risk group was a considerable positive score on this "slum-formation" factor, whereas the low-risk group had a numerically large negative score on it. A strong negative score on Factor I, or "disintegration", was further characteristic of the low-risk group, as well as a considerable positive score on Factor III, or "demographic Change I: growth in the passive sections of the population".

District 26 (Koskela), being a small one, formed a group on its own here

Table 49

**Grouping analysis. Classification of the 37 research areas into five groups
in terms of the four factors derived from the 48 variables**

Group	Factor I		Factor II		Factor III		Factor IV	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1.	.740	.376	-1.307	.353	.396	.731	-.233	.167
2.	1.164	0	.713	0	-3.829	0	-1.941	0
3.	-1.309	.230	-.200	.480	.926	.873	-1.372	1.047
4.	-.325	.742	-.129	.552	-.205	.518	.850	.470
5.	.573	.862	1.196	.554	.367	.809	-.716	.429

Research areas included in the groups:

Group 1: 5, 11, 12, 19, 21, 22, 24

Group 2: 26

Group 3: 36, 40, 41, 45, 48, 54

Group 4: 2, 4, 8, 16, 23, 25, 28, 33, 34, 35, 39, 44, 46

Group 5: 1, 13, 14, 15, 18, 29, 30, 31, 42, 52

Table 50

**Suicides and suicide rates in the five groups of districts formed
by means of grouping analysis, Helsinki 1970-71**

Group	Population	Suicides	Suicide rate
1.	89,496	38	21.2
2.	3,245	1	15.4
3.	115,375	41	17.8
4.	137,378	88	32.0
5.	155,313	71	22.8
Total	500,807	239	23.9

(Group 2), as it obtained high negative values on Factors III and IV. However, both the population of this district and the frequency of suicides in it were so small that caution should be observed in considering the suicide rate for it.

Classification of the 37 research areas into eight groups

The grouping analysis was continued by dividing the research areas into six, seven and eight homogeneous groups. The grouping proceeded in such a way that, of the five groups described above, both the high-risk group and the low-risk group, as well as one of the other three groupings, became split into two. The grouping analysis was terminated when eight district groups had been formed.

The means and standard deviations of the scores for each of the eight groups on the four factors used and the numbers of districts included in each of these groups are shown in Table 51. The numbers of inhabitants, frequencies of suicides and suicide rates for the groups of districts formed are given in Table 52.

Table 51

Grouping analysis. Classification of the 37 research areas into eight groups in terms of the four factors derived from 48 variables

Group	Factor I		Factor II		Factor III		Factor IV	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1.	.516	.272	.716	.248	-.603	.404	.896	.534
2.	-.395	.329	1.663	.578	.542	.847	.372	.241
3.	1.164	0	.713	0	-3.829	0	-1.941	0
4.	-1.300	.252	-.195	.526	-.222	.771	-.931	.383
5.	-.851	.359	-.255	.645	.431	.416	.822	.423
6.	-1.350	0	-.223	0	1.165	0	-3.578	0
7.	1.218	.352	.884	.213	.251	.760	-.368	.222
8.	.740	.376	-1.307	.353	.396	.731	-.233	.167

Research areas included in the groups:

Group 1: 2, 4, 8, 16, 25

Group 2: 29, 30, 31, 42

Group 3: 26

Group 4: 36, 40, 41, 45, 48

Group 5: 23, 28, 33, 34, 35, 39, 44, 46

Group 6: 54

Group 7: 1, 13, 14, 15, 18, 52

Group 8: 5, 11, 12, 19, 21, 22, 24

Table 52

**Suicides and suicide rates in the eight groups of districts formed
by means of grouping analysis, Helsinki 1970–71**

Group	Population	Suicides	Suicide rate
1.	39 339	37	47.0
2.	76 100	27	17.7
3.	3 245	1	15.4
4.	76 149	33	21.7
5.	98 039	51	26.0
6.	39 226	8	10.2
7.	79 213	44	27.8
8.	89 496	38	21.2
Total	500 807	239	23.9

The idea behind the application of grouping analysis was that, insofar as the frequency of suicides is dependent on the composition of the population and on its living conditions, it might be possible to identify and describe — in terms of the relatively small number of factors extracted from variables characterizing this composition and these conditions — inwardly homogeneous groups of districts where suicide rates are high and, correspondingly, other similar groups where suicide rates are low. If we assumed, on the other hand, that suicide is a phenomenon independent of external circumstances, suicides would probably be distributed evenly between various kinds of districts.

The end result of the grouping analysis indicates that there were groups of districts, homogeneous with respect to the variables used, such that the suicide rates were high in one (Group 1) and low in another (Group 6). The population of each group was about 39,000. In 1970–71, a total of 37 suicides took place in the high-risk area, the corresponding figure for the low-risk area being only eight. The suicide rates were 47.0 and 10.2 respectively and thus the rate for the former area was almost five times the rate for the latter. The difference between the rates was statistically significant ($t = 3.05$). The rate of the high-risk area also differed statistically significantly from the rates for Groups 2 and 4 and from that for the whole city.

A comparison of the means of the factor scores of the high risk group (Group 1) with those of the other groups, and with those of the low-risk group (Group 6) in particular, reveals that the first-mentioned group clearly differed from the other groups. This is apparent from Table 53. The high-risk group had a considerable positive value on Factor IV, describing a kind of demographic change characterized by a decline in the total population, a rise in the rate of

Table 53

**Results of grouping analysis: classification of the factor scores
for the eight groups of districts***

Group	Factor I	Factor II	Factor III	Factor IV
1.	+	+	-	+
2.	0	+++	+	0
3.	++	+	----	----
4.	---	0	0	-
5.	-	0	0	+
6.	---	0	++	----
7.	++	+	0	0
8.	+	---	0	0

* Means of factor scores: 0 = from 0 to +0.5 (or to -0.5); + = from +0.5 to +1.0 (- = from -0.5 to -1.0); ++ = from +1.0 to +1.5 (--- = from -1.0 to -1.5); +++ = over +1.5 (---- = numerically over -1.5).

men to women, an increase in the percentage of the older age groups, and a rise in the percentage of persons belonging to the highest social group and a fall in the percentage of those belonging to the lowest one, all these changes occurring in "old" districts. This factor was also characterized above as a "slum-formation" factor. The low-risk group, by contrast, had a numerically very high, negative value on Factor IV.

The means of the other factors for the high-risk group and those for the low-risk group were also in directions opposite to each other — as a matter of fact, almost each other's mirror images. The means for the high-risk group on the "disintegration" and "well-being" factors were positive, its mean on the "demographic change I: growth in the passive sections of the population" being negative. The low-risk group, by contrast, obtained a high positive value on the last-mentioned factor and a numerically high, negative value on the "disintegration" factor, its value on the "well-being" factor being also negative, though numerically low.

The suicide rate for Group 7 was also somewhat higher than the average for whole Helsinki, though not to a statistically significant extent. This group differed from the other groups in that it obtained a high positive score on the "disintegration" factor.

In Group 2, again, the suicide rate was slightly below the average for Helsinki. A distinctive feature about this group was its high positive value on the "well-being" factor.

To summarize the results of the grouping analysis, it was possible to

combine the research areas into groups differing from each other clearly with respect to the factors reflecting the properties of their population and its social environment. When the research areas were combined into eight inwardly homogeneous groups, the suicide rate for one group was notably high, the rate for another group being low. The area where the suicide rate was high was typified by circumstances which have here been characterized as disintegrative and by demographic changes pointing in the direction of slum-formation. In contrast to this, the areas where the suicide rates were low were characterized by conditions representing the opposite of disintegration and slum-formation. Another typical feature of these areas was that both the percentage of women and that of old people tended to be on the increase, and in this respect, too, the conditions in these areas differed from those characteristic of the areas with high suicide rates.

Grouping of the research areas on the basis of the suicide rate into high-rate and low-rate areas

The grouping of the research areas into groups homogeneous in terms of the 48 variables, considered in the preceding sections, was carried out without including the suicide rate in the set of variables influencing the analysis. The suicide rates were determined only afterwards for the groups obtained as a result of the analysis, to test the hypothesis that this rate varies with variations in social environment.

During the stage of the study to be considered in this section, the analysis was carried out in reverse order. The research areas ($N = 37$) were first divided into three groups with respect to the age-adjusted (15-) suicide rate. Ten high-rate areas were thus obtained, in each of which the suicide rate exceeded 38. The research areas for which the rate ranged from 22 to 37 were assigned to the medium-rate group, which came to include 13 areas. Finally, the low-rate areas, where the suicide rate was below 22, came to number 14.

It was hypothesized that, insofar as the frequency of suicides is dependent on social environment, areas where the suicide rate is high and areas where it is low are likely to differ from each other in terms of variables describing these areas in respect of their populations and their social environments. To test this hypothesis, factor analyses of the 48 variables included in the factor analysis for all 37 research areas (see Appendix 2) were carried out separately for the high-, medium- and low-rate groups. This was done in an attempt to describe each of the three groups in terms of the emerging factors and compare them with each other, and, further, to divide the groups by means of grouping analysis into homogeneous subgroups in terms of factor scores, with the object of seeking to identify several different high- and low-rate areas. The medium-rate areas will not be considered here.

High-rate areas

First a factor analysis of the 48 previously described variables was carried out for the ten high-rate areas (Research Areas 1, 2, 4, 8, 16, 23, 25, 34, 36 and 44). Employing the principal axis method, eight factors having the eigenvalues 19.3, 7.2, 5.7, 4.6, 3.2, 2.9, 1.7 and 1.2 respectively were obtained. Of the 4 to 8-factor varimax solutions, the four-factor solution was chosen on the basis of the eigenvalues and the interpretability of the factors for the final analysis (see Appendix 2).

Factor I was termed a "lack of regeneration" factor. Characteristic of it were the absence of new residential buildings, location of the district in Inner Helsinki, a high percentage of adult women and low percentage of children, a decline in population, a fall in the percentage of members of the upper social groups and a high percentage of members of the lowest social group. The positive end of the factor may be interpreted as reflecting a process forming the opposite of regeneration and growth, whereby groups of people who are quite poorly integrated with the community tend to gather in the old districts in the centre of the city.

Factor II was a "sex ratio" factor (the ratio of men to women). The highest loadings were those in the variables indicating the percentage of adult men in the total population and the rise in this percentage. The schizophrenia index also had a considerable positive loading on it.

Factor III was a "skilled workers" factor, the highest loadings of which were on variables indicating the relative absence of persons belonging to social groups I and II and a high percentage of people belonging to social group III. The percentage of industrial workers and that of economically active population also obtained high loadings. The schizophrenia index had a high positive loading on this factor, too. The lowest social group did not have a high loading, and thus the factor actually had to do with skilled workers.

Factor IV was named a "well-to-do middle class" factor. Characteristic of this factor were a low percentage of persons belonging to social group IV and a high percentage of those belonging to social group II. High loadings were also obtained by the percentage of economically inactive population and that of Swedish-speaking people. Moreover, location in Inner Helsinki had a loading on this factor.

Thus, in the description of the ten high-rate areas the 48 variables could be reduced to four factors: 1. lack of regeneration, 2. sex ratio (men/women), 3. skilled workers and 4. well-to-do middle class factors. A central role in the description was occupied by Factor I, or a dimension at the positive end of which there were the "aging" districts in the centre of the city where there is little renewal and new construction, where the population is declining, the percentage of children in the population is decreasing and that of old people and members of the lowest social groups is rising.

The high-rate areas were classified by means of grouping analysis in terms of the factor scores into two, three, four and five groups. The three-group case, regarded as interpretationally the best, was subjected to closer scrutiny. The composition of the three groups and the factor scores for them; and the corresponding populations and suicide rates are presented in Tables 54 and 55.

The division into two groups classified the high-rate areas into an Inner Helsinki group (areas 1, 2, 4, 8, 16, 23, 25) and an Outer Helsinki group (34, 36, 44), mainly on the basis of Factor I. The division into three resulted in two Inner Helsinki groups (Group 1: 4, 8, 23 and Group 2: 1, 2, 16, 25).

Table 54

**Results of grouping analysis for the ten high-rate areas:
classification of the factor scores for the three groups***

Group Areas	Factor scores			
	I	II	III	IV
1. 4, 8, 23	0	++	0	0
2. 1, 2, 16, 25	+	-	0	0
3. 34, 36, 44	--	0	0	+

* Means of factor scores: 0 = from 0 to +0.5 (or to -0.5); + = from +0.5 to +1.0 (- = from -0.5 to -1.0); ++ = from +1.0 to +1.5 (-- = from -1.0 to -1.5).

The highest suicide rate (50.0) was the one for Group 2, including the Research Areas 1, 2, 16 and 25. These formed two continuous geographical areas, one at the very centre of the city and the other on the northwestern border of Inner Helsinki. Characteristic of this group were a considerable positive loading on the "lack of regeneration" factor and a considerable negative loading on the "sex ratio" (men/women) factor. In this area with a population of 29,980, a total of 30 suicides were committed in 1970-71, the corresponding expected value being 14.

In Group 1 the suicide rate (41.3) was also high, this group comprising Research Areas 4, 8 and 23, located in Inner Helsinki. The group obtained a high positive loading on the "sex ratio" (men/women) factor.

The suicide rate for Group 3 was distinctly lower (33.8). This group consisted exclusively of suburban areas, namely, of Research Areas 34, 36 and 44 forming a continuous area in Eastern Outer Helsinki. The group had a high negative loading on the "lack of regeneration" factor (in distinct contrast to Group 2, where the suicide rate was highest) and a considerable positive loading to the "well-to-do middle class" factor.

Table 55

**Suicides and suicide rates in high-, medium- and low-rate areas
in Helsinki in 1970-71**

	Population	Suicides	Suicide rate
High-1	23,027	19	41.3
High-2	29,980	30	50.0
High-3	53,187	36	33.8
Total high	106,194	85	40.0
Medium-1	37,065	17	22.9
Medium-2	32,670	18	27.5
Medium-3	10,972	4	18.2
Medium-4	63,445	27	21.3
Medium-5	66,098	35	26.5
Total medium	210,250	101	24.0
Low-1	3,245	1	15.4
Low-2	59,249	18	15.2
Low-3	56,255	18	16.0
Low-4	26,388	8	15.2
Low-5	39,226	8	10.2
Total low	184,363	53	14.4
Total	500,807	239	23.9

Low-rate areas

The low-rate areas to be analysed comprised Research Areas 11, 13, 15, 18, 21, 24, 26, 29, 31, 35, 40, 42, 46 and 54. The factor analysis of the previously described 48 variables carried out by the principal axis method yielded in the case of these areas an eight-factor solution in which the eigenvalues of the eight factors were 18.0, 8.5, 6.4, 3.9, 2.3, 1.7, 1.4 and 1.1 respectively. Of the 4 to 8-factor varimax solutions tried out, the four-factor solution was settled on (see Appendix 2).

The factor of central importance, Factor I, was named a "regenerating, growing city" factor. This was almost the exact reverse of the "lack of regeneration" factor obtained with the high-rate areas. It characterizes mainly the strong population growth and new building taking place in suburban areas, and

features associated with these, such as the high percentages of people belonging to multi-person households and of children and a composition of the population typified by over-representation of the upper and under-representation of the lower social groups.

Factor II was a "well-being" factor, similar to the previously described Factor II obtained from the analysis of the total material. Factors III and IV were also very similar to their counterparts in the factor analysis of the total material. The former was a sex ratio factor, indicating the rise in the percentage of women. The latter was also a demographic change factor, referred to as a "decline in the population – growth in the men/women ratio" factor.

In grouping analysis it was possible to classify the low-rate areas in terms of the above four factors into five groups, inwardly homogeneous but different from one another. The populations and suicide rates for these groups and their factor scores are shown in Tables 55 and 56.

Table 56

**Results of grouping analysis for the 14 low-rate areas:
classification of the factor scores for the five groups***

Group	Areas	Factor scores			
		I	II	III	IV
1.	26	—	0	0	0
2.	11,21,24,35,40,46	0	—	0	0
3.	13,15,18,29	—	+	0	0
4.	31,42	+	+++	0	+
5.	54	++	0	—	---

* Means of factor scores: 0 = 0 to +0.5 (or to -0.5); + = from +0.5 to +1.0 (- = from -0.5 to -1.0); ++ = from +1.0 to +1.5 (- = from -1.0 to -1.5); +++ = over +1.5 (--- = numerically over -1.5).

The five groups included one (Group 5) for which the suicide rate (10.2) was clearly lower than the rate for the other four groups (15.5). This area was Research Area 54, or the one which was also found to form a group on its own in the grouping of the total material into eight groups. In the present grouping analysis this area obtained a high positive score on the "regenerating, growing city" factor and a very high negative score on the "decline in the population – growth in the men/women ratio" factor and also a considerable negative score on the "rise in the percentage of women" factor. Research Area 54 was made up of districts in which population growth and new building had been strongest during the last decade. In this area with a population of 39,336, no

more than 8 suicides occurred in 1970–71, the mathematical expectation of the number of suicides for it being 19.

The factor scores obtained by the other low-rate areas differed rather distinctly from those for Research Area 54. Factors III and IV played no very considerable part in the grouping, which took place principally on the basis of the first two factors ("regenerating, growing city" and "well-being"). Group 4 (areas 31, 42) obtained a very high score on the "well-being" factor and also a considerable positive score on the "regenerating, growing city" factor. Group 3 (areas 13, 15, 18, 29) also obtained a considerable positive score on "well-being" but a negative score on the "regenerating, growing city" factor. Group 2 (areas 11, 21, 24, 35, 40, 46) was characterized by a negative value on "well-being" and Group 3 (area 26) by a negative value on the "regenerating, growing city" factor.

Thus, low suicide rates were also met in areas low on "regeneration" (Groups 1 and 3); and "well-being" did not seem to be a necessary condition for a low suicide rate (Group 2), either.

Relationship between the frequency of disturbances of mental health and suicide rates

This part of the study started from the hypothesis that suicides and mental health disturbances tend to concentrate in the same population groups and residential areas and that the suicide rate may be regarded as one indicator of the psychosocial well-being of the population. To investigate this point, the psychiatric hospital admission rates in various areas of Helsinki, characterized and grouped in terms of factors describing their populations and their social environments, were compared with the suicide rates for the same areas.

Initially, Groups 4 and 3 yielded by the grouping analysis in which the research areas were classified into five groups in terms of the factors obtained from 48 variables were compared with each other. The suicide rate was 32.0 in the former group and 17.8, or less by almost a half in the latter. The former group of areas obtained a considerable positive score on the "slum-formation" factor, whereas the latter had numerically high negative scores on this factor and on "disintegration", and in addition, a positive score on the "demographic change: growth in the passive sections of the population" factor (cf. Table 49).

The psychiatric hospital admission rates for the high-risk and low-risk areas described above are shown in Table 57. Irrespective of the admission indicator employed, disturbances of mental health appeared to be more frequent in the former than in the latter group of areas. The difference was clearest in the schizophrenia first-admission index, and the difference was also considerable in the case of admissions to the psychiatric university hospital. On the other hand, the two groups of areas differed only slightly as regards the municipal and

Table 57

**Psychiatric hospital first-admission rates for high suicide risk
and low suicide risk areas in Helsinki in 1970-71**

Variable	Admission rates		Ratio	Signifi- cance level (t)
	high-risk area *	low-risk area **		
Schizophrenia	24.0	8.7	2.8	xx
Private hospital	18.9	15.6	1.2	NS
University clinic	35.7	18.2	2.0	xx
Municipal hospital	28.4	23.4	1.2	NS

* Research areas: 2,4,8,16,23,25,28,33,34,35,39,44 and 46; suicide rate 32.0, population 137,375.

** Research areas: 36, 40,41,45,48 and 54; suicide rate 17.8, population 115,375.

private psychiatric hospital admission rates.

The analysis was continued by starting next from the results of the grouping analysis in which the research areas were divided into eight groups (cf. Table 51). In this case the suicide rate for the high-risk area (Group 1) was 47.0, the rate for the low-risk area (Group 6) being 10.2. Thus, the rate for the former areas was here almost five times the rate for the latter. Characteristic of the high-risk areas were positive scores on the "slum-formation" and "disintegration" factors and a negative score on the "demographic change: growth in the passive sections of the population" factor. In contrast to this, the low-rate areas were typified by a very high negative score on the "slum-formation" factor and also by a high score on the "disintegration" factor.

The psychiatric hospital admission rates for these two groups of areas are given in Table 58. The association between mental health disturbances and suicide rates was even more clear-cut here than it was according to the results of the preceding analysis. The value of the schizophrenia first-admission index for the high-risk areas was four times the corresponding value for the low-risk areas; and both the municipal hospital and private hospital admission rates were almost three times as high for the former than for the latter areas and the value of the psychiatric university hospital admission rate for the former was over twice the rate for the latter.

It can be stated, by way of a summary, that, when the areas of Helsinki are grouped in terms of variables characterizing their populations and social environments into inwardly homogeneous groups, areas can be identified where both suicides and mental health disturbances are frequent, and, on the other

Table 58

**Psychiatric hospital first-admission rates for high suicide risk
and low suicide risk areas in Helsinki in 1970-71**

Variable	Admission rates		Ratio	Signifi- cance level (t)
	high-risk areas*	low-risk areas**		
Schizophrenia	30.5	7.6	4.0	x
Private hospital	35.6	12.7	2.8	x
University clinic	43.2	17.8	2.4	x
Municipal hospital	48.3	17.8	2.7	x

* Research areas: 2,4,8,16 and 24; suicide rate 47.0, population 39,339.

** Research areas: 54; suicide rate 10.2, population 39,226.

hand, areas where both are infrequent. Characteristic of the former areas are tendencies toward slum-formation and disintegration, whereas the latter areas are typified by a definite absence of such tendencies.

The above kind of association between suicide rates and admission rates is met, however, only in city areas of a certain type and, thus, is not a general one. That this is the case was already reflected by the previous analysis of correlations which revealed that there was a significant relationship between the suicide rate and the schizophrenia index only (see Table 35). The same circumstance is also observed when the ten high-rate areas are compared with the 14 low-rate areas with respect to the recorded admission rates (Table 59). This comparative analysis reveals that, as far as these admission rate variables are concerned, the two groups of areas differ only as regards the schizophrenia first-admission index.

With a view to analysing the interdependence of suicides and mental health disturbances occurring only in areas of a certain type the values of the admission rate variables for each of those areas of high and low suicide rates that had been obtained as a result of grouping analysis were examined separately (Table 60).

In each of the three high-rate areas the value of the schizophrenia first-admission index was notably higher than the value for any of the six low-rate areas. In this respect the finding is unambiguous and consistent with previous results.

By contrast, as far as the other admission rate variables are concerned, both the high-rate and the low-rate areas may be divided into two groups: both high and low values of the admission rate variables occur in the high-

Table 59

Psychiatric hospital first-admission rates for high suicide rate and low suicide rate areas in Helsinki in 1970-71

Variable	Admission rates		Ratio	Significance level (t)
	high-rate areas*	low-rate areas**		
Schizophrenia	23.5	10.3	2.3	xx
Private hospital	23.5	24.4	1.0	NS
University clinic	39.6	39.6	1.0	NS
Municipal hospital	34.8	30.4	1.1	NS

* Research areas: 1, 2, 4, 8, 16, 23, 25, 34, 36 and 44; suicide rate 40.0 population 106,194.

** Research areas: 11, 13, 15, 18, 21, 24, 26, 29, 31, 35, 40, 42, 46 and 54; suicide rate 14.4, population 184,363.

Table 60

Psychiatric hospital first-admission rates for the three high-rate and five low-rate areas formed by means of grouping analysis

Admission variable	Admission rates in high (H) and low (L) rate areas*							
	H-1	H-2	H-3	L-1	L-2	L-3	L-4	L-5
Schizophrenia	43.4	20.0	16.9	0.0	11.8	10.7	11.4	7.6
Private hospital	43.4	20.0	16.9	30.8	13.5	32.0	49.3	24.4
University clinic	47.8	40.7	32.0	61.6	40.5	64.0	15.2	17.8
Municipal hospital	47.8	43.4	24.4	30.8	38.8	32.0	26.5	17.8

* The difference between the admission rates for areas H-1 and L-5 was significant in the case of the admissions-for-schizophrenia variable and almost significant in the other three cases.

rate as well as in the low-rate area groups (Table 61). High admission variable values are met in the high-rate area groups 1 and 2 and in the low-rate area groups 2 and 3. The admission figures for low-rate area group 1 are also comparatively high, but as the population of this area is small, the part played by chance may be considerable. High-rate area group 1 was characterized previously as a main-city area which scored high on the sex ratio (male/female) factor, whereas high-rate area group 2 had a high score on the "lack of regeneration" factor. Low-rate area group 2, again, was typified by a considerable negative

score on the "well-being" factor and low-rate area group 3 by a considerable negative value on the "regenerating, growing city" factor.

Of the high-rate areas, high-rate area group 3 had low admission figures, and in this area group the suicide rate was also distinctly lower than in the other two high-rate groups. This group had a high negative score on the "lack of regeneration" factor and a considerable positive score on the "well-to-do middle class" factor. As for the low-rate areas, Group 4 obtained a very high positive score on the "well-being" factor and also a considerable positive score on the "regenerating, growing city" factor. The lowest admission figures were those of low-rate area group 5, which had a high positive score on the "regenerating, growing city" factor and a very high negative score on the "decline in the population, rising sex ratio (male/female)" factor.

To sum up, high admission figures, which have in the present study been used as indicators of the occurrence of mental disturbances, were met in areas typified by tendencies toward slum-formation, disintegration, lack of regenera-

Table 61

Schematic representation of the interrelation between suicide rates and frequency of mental disturbances in the high suicide risk and low suicide risk areas in Helsinki in 1970-71

ADMISSION		SUICIDE RATE
RATE	HIGH	LOW
HIGH	High-1: men outnumber women, Inner Helsinki	Low-1: lack of regeneration
	High-2: lack of regeneration Inner Helsinki	Low-2: lack of well-being Low-3: lack of regeneration
LOW	High-3: regeneration, well-being, Outer Helsinki	Low-4: well-being, regeneration, Outer Helsinki Low-5: regeneration, men do not outnumber women, Outer Helsinki

tion and lack of well-being. These same factors formed a link between suicide rates and the frequency of occurrence of mental disturbances. It was observed, on the other hand, that there were groups of high-rate areas which were characterized by regeneration and well-being and where mental health disturbances were not frequent (high-rate area group 3). Nevertheless, in the areas where regeneration was strongest and the population growth fastest (low-rate area group 5), both suicides and mental disturbances were least frequent.

DISCUSSION

The purpose of the present study was to consider all the suicides committed in Helsinki in the years 1960–61 and 1970–71 relative to their social environments. The aim was to investigate, in particular, how different social environments and changes taking place in these are reflected in suicide rates.

An effort was made to include in the study actually all the suicides that took place in Helsinki in the years concerned. The procedure used to ensure the attainment of this goal is described in detail in Part I. Since the study is concerned with all the suicides committed by the inhabitants of Helsinki during the time periods concerned, and not with a sample of them, a point that may easily give rise to discussion is the use of the tests of statistical significance (cf., e.g., Blalock 1972). On the one hand, all the differences observed here were "actual" differences, not in need of ordinary significance testing. On the other hand, statistical tests can also be used in this sort of situation, to test the part possibly played by chance in the coming into existence of the differences. In the present study the differences observed have been dealt with by taking both views into consideration, so that significance tests have been employed in a way different from their ordinary way of application, or mainly as weights of a kind in interpretations.

The study considers suicides committed during two two-year periods separated by an interval of nine years. One of the decisive reasons why precisely these two periods were chosen was the possibility of making use of the general population census data for the years 1960 and 1970. Two-year rather than one-year periods were chosen for the study in order to obtain a large enough suicide population. Nevertheless, the frequencies of suicides in the research areas formed for the study remained relatively low — a factor which means limitation of the conclusions and inferences to be drawn from the results. On the other hand, had a greater number of years been included, this would have complicated the comparison of the findings with the population census data and would have excessively reduced the length of the interval between the research periods. Inclusion of more than two research periods would have offered better possibilities for the analysis of changes, but it was unfeasible because of the absence of census data for the intervening years. The research periods do not depart from the general long-term trend shown by the frequency of suicides to an extent excluding their use in the evaluation of the general development of suicide situation in Helsinki (cf. Tables 20 and 21).

Both general population census data and admission figures reflecting the psychiatric morbidity of the population were used in the study for the description of the social environment of the population. No detailed investigations are available concerning the reliability of the census data for Helsinki. Yet the view is generally held that, in groups of population as large as those dealt with in this

study, the chance errors of measurement regarding the characteristics of the population lose significance, and thus the reliability of the measurements can be considered very high (Valkonen 1971).

The mental health variables used in the study were ones based on hospital admission frequencies. It is clear that this means attending only to the gravest disorders of mental health. On the other hand, the frequencies of admission in various sections of the city are comparable to one another, since the same hospitals serve all of these sections. In consequence, the differences between various areas in admission figures are not due to differences in the availability of the services concerned but can be considered to reflect the actual differences in morbidity. Yet it should be borne in mind in the case of admission rates, just as in the case of suicide rates, that even rather small changes in absolute frequencies are likely to result in considerable changes in the corresponding rates.

The results of the study for the period 1960–61 are in many respects consistent with expectations and correspond to views previously presented in the literature. One central observation was that suicides were distributed unevenly between the various parts of the city. Suicides, and those committed by men in particular, showed a tendency toward concentrating in the main city area, or Inner Helsinki. The finding that suicide rates tend to be higher in the central than in the peripheral parts of urban areas is a classical observation made in numerous studies (e.g., Cavan 1928, Schmid 1928, Sainsbury 1955) and also consistent with previous observations on Helsinki (Achté & Hyvärinen 1962, Achté & Järvenpää 1969, Lönnqvist & Achté 1972). Several authors have interpreted this observation as indicating that social disorganization tends to occur accentuatedly in the central parts of urban areas for various reasons, so that the centre on the one hand attracts persons belonging to various risk groups and, on the other hand, makes in itself for an increased suicide risk (e.g., Yap 1958, Seiden 1967, Attkisson 1970). In many towns the skid-row and slum areas are situated at the very centre. In Helsinki no clear-cut areas of this kind have existed, but tendencies toward similar developments have also been perceptible there. In contrast to many other studies (e.g., Whitlock 1973), the present study revealed that the suicides committed by men and those committed by women were distributed clearly differently between the various parts of Helsinki in 1960–61. With women the distribution was far more even than with men. One possible interpretation of this finding would be that the suicides committed by women were less dependent on social environment factors than these committed by men, or were dependent on different factors. Moreover, the suicides committed by the non-permanent population, which accounted for a fifth of all suicides, were in a large majority of the cases committed by alcoholic men who lacked both dwellings and vocational skills and used mainly to live in the central parts of the city. It should be pointed out, on the other hand, that urban conditions mean for women a far more heightened suicide risk in comparison with the whole country than they do for men. As appears

from Table 21, the ratio of the suicide rate for Helsinki in 1960-61 to that for the whole country was 1.3 in the case of men but in the case of women almost twice as high, or 2.4 in 1960 and 2.1 in 1961.

The correlations of the suicide rate with the variables used to describe the social environment for the population were in 1960-61 consistent with expectations in many respects and at the same time similar to those obtained in a previous study concerning Helsinki (Lönnqvist & Achte 1972). In 1960-61 the suicides committed in Helsinki showed a tendency toward concentrating in those parts of the city where people living alone, subtenant households, old people and women were over-represented and children were under-represented. All these variables reflect a relative infrequency of families, and families with children in particular. Assuming that a high frequency of families can be regarded as one indicator measuring the integration of a community (cf., e.g., Trute & Segal 1976), the correlations observed have to be interpreted in accordance with the initial assumption as indicating that high suicide rates are associated with a low degree of integration in the community.

Previously reported correlations of suicide rates with demographic changes have been somewhat conflicting. In his studies concerning London, Sainsbury (1955) found significant correlations between the suicide rate and the frequencies of people living alone, of those living in boarding houses and of divorces in the population; Whitlock (1973) later found the suicide rate to correlate with the percentages of people living alone and divorced people, the sex ratio (female/male), the infrequency of children and the percentage of foreign-born persons but not with that of old people. McCulloch & al. (1967) were unable to find in Edinburgh significant correlations between the suicide rate and the percentage of people living alone and that of old people (persons aged 65+), but they found the suicide rate to correlate with the percentages of divorced persons and subtenants (many tenement houses) in the population and, in particular, with "much overcrowding". Lester (1970), again, found in Buffalo, U.S.A., high correlations between the suicide rate and the percentages of old people, persons representing high educational levels and widowed and divorced persons. Bagley & al. (1973) observed, in Brighton, the suicide rate to correlate strongly with the frequencies of people living alone and of rented dwelling units and, negatively, with the frequency of large households (families with children).

Thus the suicide rates have been found to correlate somewhat differently in studies dealing with different towns. The correlations obtained in the present study for the period 1960-61 were similar to those observed in other, previous studies, though they were not actually identical with the correlations yielded by any individual prior study. The results must be interpreted mainly to suggest that in each particular community the frequency of suicides is connected in a way specific to it with people's social environment. One common feature about the results yielded by various studies seems to be, however, that

suicide rates tend to correlate with demographic variables indicating disintegration at the family level or — according to some studies — even more generally in the community at large.

The correlations for the period 1960–61 of the suicide rate with the variables indicating the socio-economic composition of the population proved somewhat lower than expected. They were in the expected direction, however, the suicide rate correlated positively with the proportion of the lowest social group and negatively with that of the highest social group in the population. Correlations with the percentages of economically active persons, industrial workers and persons who had passed the matriculation examination were not high. In previous studies concerning Helsinki the proportion of the lowest social group in the population has borne a considerable correlation with the suicide rate (Achte & Järvenpää 1969, Lönnqvist & Achte 1972). That this correlation was comparatively low in the present study can be partly explained by the fact that the suicides committed by persons belonging to the "non-permanent" population (19 per cent of all suicides) were excluded from this analysis. However, 39 per cent of the non-permanent population belonged to the lowest social group, no more than 10 per cent of it belonging to social group I. Moreover, the largest part of this population group inhabited those parts of the city where the lowest social group was over-represented.

The extent to which suicide rates have been found to correlate with the socio-economic composition of the population varies greatly from one study to another. The old observation that the suicide rate correlates with the proportion of the upper social classes in the population is very frequently stressed in the literature (cf. Stengel 1973). Results of this kind have been obtained by, e.g., Whitlock (1973) and Bagley & al. (1973) in England. On the other hand, a number of authors — e.g., Maris (1969) in Chicago, Yap (1958) in Hong Kong and, also, Lönnqvist & Achte (1972) in Helsinki — have found suicide rates to correlate negatively with social class. Finally, Shneidman & Farberow (1960), for instance, were unable to find any correlation between suicide rates and people's socio-economic position in Los Angeles. All these observations may be interpreted as speaking for the view that suicides are connected with people's social environment differently in different communities. It can further be assumed that socio-economic status may involve a variety of conflicting factors, too, with regard to the risk of suicide. A good social position may imply, both in the case of an individual and at the various levels of the community, the presence of resources of coping capacity for resolving crises, for instance; but, on the other hand, the efforts to attain or preserve a high social position may also make for an increased proneness to crises.

Correlations between suicide rates and variables indicating the mental health of people have been investigated to a relatively small extent. In the United States, a distinct positive correlation was obtained in Chicago between the suicide rate and the frequency of mental disturbances (Cavan 1928, Faris

& Dunham 1939, Mowrer 1942). A strong positive correlation between these two has also been observed in a medium-sized city in England, namely, Brighton (Bagley & al. 1973).

In a previous study a notable positive correlation was also observed in Helsinki between psychiatric hospital admissions and suicide rates (Lönnqvist & Achte 1972). In the present study the correlations of the suicide rate with those mental health variables were, in 1960–61, lower than expected; in both studies, however, the correlations were in the same direction. The explanation of the differences between the previous study and the present one may lie partly in the fact that the number of observations was less in the present case and that the significance level of the correlations was therefore lower. Moreover, here the research period, 1960–61, included only two years, whereas the previous study considered a ten-year period, 1956–65, disregarding the possible changes in the suicide rates for the various areas over this period. However, the correlations obtained in the present study indicated that there was a connection between suicide rates and mental disturbances, despite the fact that the distribution of suicides was not completely consistent with that of mental disturbances.

One of the basic assumptions underlying the present study was that suicide is a phenomenon of which the "causes" are multi-factorial and specific in each individual case. In consequence, one cannot even expect to obtain very high correlations between general demographic variables and suicide rates, particularly insofar as the former are considered singly, and separately from one another. In an attempt to estimate the possible joint effect of these variables, use was made in the present study of the stepwise regression analysis technique. Three of the variables used to explain the variation in the suicide rate in 1960–61 — namely, the percentage of adults in the population (i.e., the relatively small number of children), the sex ratio (female/male) and the relative absence of persons belonging to social group I in the area — were capable of accounting for 45 per cent of the variance of the (crude) suicide rate. The model used to explain the age-adjusted rate (15–) came to include one further variable, namely, the rate of hospital admissions for schizophrenia, and the model proved capable of accounting for 35 per cent of the variance of the dependent variable. These percentages can be considered to suggest that suicide rates do depend on the social environment of people. Suicides were infrequent in the parts of Helsinki typified by large numbers of children, a well-balanced sex ratio, over-representation of social group I and a low frequency of mental disturbances. In areas representing the opposite of such a state of affairs the suicide rates tended to be higher. The result seems to support the assumption that the suicide rate is inversely related to the degree of integration of the community.

One of the chief aims of this study was to investigate how the changes occurring in a community are reflected in the suicide rate for it. To this end the 1960–61 and 1970–71 suicide rate patterns of Helsinki were compared by

employing the same division into areas on both occasions. The interval between these two two-year periods was considered to be long enough for the purpose; it was a period characterized by rapid population growth and intensive new building and one during which the entire city milieu was in process of change. The population of Helsinki grew by 12.7 per cent between 1960 and 1970. In suburban Outer Helsinki the population increased by 58.7 per cent, whereas in Inner Helsinki it declined by 19.1 per cent. In 1970–71, 55.5 per cent of the inhabitants of Outer Helsinki and 12.2 per cent of those of Inner Helsinki lived in buildings completed in 1960 or later. People who lived in quite new buildings, completed in 1965 or thereafter, accounted for 30.5 per cent of the population of Outer Helsinki and for 1.7 per cent of that of Inner Helsinki.

Internal migration was very strong in Finland in the 1960s. One of the major flows of migrants led from the rest of the country to Helsinki, the capital city, and to the Province of Uusimaa surrounding it. The assumption seems justified that this nation-wide process of change was also reflected as changes in Helsinki and in its suicide patterns. In the years 1962–69 a total of 194,242 persons moved to Helsinki, whereas the number of those who left Helsinki during the same years was 154,479. Of the in-migrants, 66 per cent came from outside the Province of Uusimaa, whereas 39 per cent of those who left Helsinki moved to live in Uusimaa (Saxén 1972), which was urbanized fast.

In 1960–61 the suicide rate computed from the official cause-of-death statistics was 30.1 per 100,000 population per year in Helsinki and 22.8 in the rest of the Province of Uusimaa surrounding it. For the rest of Finland the corresponding figure was 19.5. A decade later, in 1970–71 the corresponding figures were 25.7, 23.4 and 21.1 respectively. Thus the differences between these various parts of the country had diminished. The suicide rate rose elsewhere in Finland by 8 per cent and in Uusimaa by 3 per cent but fell in Helsinki by 15 per cent. The changes were in the same direction with both sexes. Thus it would seem that the strong internal migration and rapid population growth were not reflected in the figures for Helsinki in 1970–71 as increases but, rather, as decreases in suicide rates. It is also interesting that the differences in the suicide rate between Helsinki, the Province of Uusimaa and the rest of Finland were accounted for almost entirely by differences in the suicide rates for women (20.1, 10.3 and 7.6 respectively). In the case of men, the differences between the corresponding suicide rates in 1970–71 (37.3, 37.4 and 34.5 respectively) were not at all notable any longer.

Comparative studies dealing with the same urban areas at different times have previously been conducted only in the case of two big cities, London and Chicago, in both of which the distribution of suicides was found to have been quite similar at different times (Sainsbury 1955, Whitlock 1973 and Cavan 1928, Mowrer 1942, Maris 1969). In the present study, by contrast, both the distribution of suicides between the various districts of the city and their relationships with the social environment were clearly different in 1970–71 from

what they had been in 1960–61.

In 1960–61 the suicide rate for Inner Helsinki was 32.3, the corresponding figure for Outer Helsinki being 14.4; a decade later the corresponding figures were 28.5 and 20.4 respectively. Thus the rate for Inner Helsinki, or the main city area, had declined, at the same time that the rate for suburban Outer Helsinki had risen. Corresponding changes also occurred in the absolute numbers of suicides. Of all the suicides committed in Helsinki in 1960–61, 76.7 per cent took place in Inner Helsinki; by 1970–71, this proportion had fallen to 51.0 per cent.

One of the most noteworthy changes in the distribution of suicides was that they had "shifted" from the centre of the city toward its suburban areas, a phenomenon that was particularly marked with the suicides committed by men. In 1960–61, the ratio between the rates for men in Inner and Outer Helsinki was 2.8, whereas in 1970–71 it was only 1.2.

In Inner Helsinki the suicide rate for men declined by 21 per cent, whereas the rate for women remained unchanged. In Outer Helsinki, again, the rate for men rose by 78 per cent, at the same time that the rate for women remained the same there also. In Inner Helsinki the rate for men (36.2) was even after these changes of the same order of magnitude as elsewhere in Finland and, in Outer Helsinki, it was distinctly lower (29.7) than the corresponding rate for the rest of the country. In Inner Helsinki the rate of women was over twice the corresponding rate in the rest of the country both in 1960–61 and 1970–71, and in Outer Helsinki, too, it was notably higher than elsewhere in Finland.

An observation of some interest was that in 1960–61 the rate of men in suburban Helsinki was lower by a half compared with the Province of Uusimaa outside Helsinki and with the rest of Finland, and that it rose, with the process of change that characterized these suburban areas over the decade concerned, but remained still somewhat lower than the average for the country.

Examination of the changes that occurred in the suicide rates for the various districts of Helsinki produced a rather peculiar finding: suicides increased in those parts of the city where they had previously been infrequent and decreased where they had previously been frequent. Increases in suicide rates concentrated in the eastern and northern parts of the city, whereas notable decreases were recorded in Inner Helsinki except in the very centre of the city (see Appendix 1). On the whole, the process of change led to a more even distribution of suicides between the various parts of Helsinki.

One typical example of the changes in suicides in Helsinki between 1960–61 and 1970–71 is provided by Research Areas 19 (Kallio, Sörnäinen, Mustikkamaa) and 36 (Viikki, Pukinmäki, Malmi). The suicide rate for Research Area 19 fell from 46.6 in 1960–61 to 19.5 in 1970–71, or by more than a half. In Research Area 36 the rate rose over the same period from 17.5 to 32.4, or became about twofold. In both areas the changes in the composition of

the population had been in a socio-economically favourable direction. Compared with Research Area 19, however, the socio-economic status of the population of Research Area 36 was notably higher on average. Both areas were typified by renewal and/or new building. By the end of 1970, 28 per cent of the population of Research Area 19 and as much as 70 per cent of that of Research Area 36 lived in buildings completed in 1960 or later. The most remarkable difference between these two areas was, however, that the population of the former diminished by 13 per cent, whereas that of the latter grew by 11 per cent. Measured in terms of hospital admission rates, mental disturbances were equally frequent in both areas in 1960–61, but more frequent in the latter than in the former area in 1970–71. What was concerned was urban renewal in the former case but mainly the construction of entirely new residential neighbourhoods in the latter.

Research Area 54 (Vuosaari – Mellunmäki) provides a different kind of example. What is concerned in that case is the construction of an entirely new suburban area, where the frequency of suicides developed favourably. The suicide rate for this area was low even in 1960–61 but declined further to a significant extent over the decade in question.

Thus the changes occurring in the suicide rate do not seem to depend in any distinct and simple way on changes taking place in the urban environment. This is already evident from the fact that changes in the suicide rate correlate only very weakly, though negatively, with population growth and new building.

The changes dealt with above had to do with the suicides committed by persons belonging to the "permanent population". However, considerable changes also occurred in suicides committed by what has here been called the "non-permanent population". In 1960–61, the suicides in this group accounted for 19 per cent of the total suicides committed in Helsinki, but in 1970–71 for only 12 per cent. This change explains 68 per cent of the decline in the suicide rate for Helsinki between the two research periods. A nuclear group in the non-permanent population is made up of persons who are without a dwelling, belong to the lowest social groups, are often alcoholics and suffer from both somatic and psychic disorders. A majority of the suicides due to the non-permanent population were committed by men. Despite the fact that the decline in the suicide rate of the non-permanent population was as large as 39 per cent, this rate was still nine times the rate for the permanent population.

The non-permanent population represents most clearly a disintegrated section of the population: it consists of persons without permanent dwellings, persons who do not generally have permanent jobs, of whom a majority are living alone, and of whom many have moved to live temporarily outside Helsinki. This section of the population also includes that group of people who in big cities inhabit the slum and skid-row areas, where suicide rates are high

(Attkisson 1970, Morris & al. 1974).

The notably high suicide rates of the non-permanent population lend support to the assumption that suicide rates correlate with disintegration. No attempt will be made in this part of the study to consider in detail the factors to which the decline by 39 per cent in the suicide rate for the non-permanent population could be ascribed. Part of the explanation is likely to lie, however, in the strong development of various social security schemes in Finland in the 1960s, offering supportive help to this section of the population. This would speak for the correctness of the assumption that a rise in the degree of integration of the community (the support given by the community to a risk group) tends to reduce the frequency of suicides.

Compared with 1960–61, the suicide rate correlated in 1970–71 somewhat differently and, on the whole, to a less significant extent, with the variables describing the social environment of the population. For example, the suicide rate correlated no longer significantly with such variables as the percentages of persons living alone, old people, women, adults, and subtenants in the total population, though the directions of the correlations had remained unchanged. On the other hand, the suicide rate did correlate significantly with the shortness of the distance of the residential district from the centre of the city and, negatively with the percentage of people living in recently constructed buildings. The correlations with the variables used to describe the socio-economic composition of the population and its mental health were also comparatively low. In contrast to the years 1960–61, the suicide rate bore now a positive correlation not only to the percentage of persons belonging to social group IV but also to the percentage of those belonging to social group I, though the correlation was statistically insignificant. Of the mental health variables, only the schizophrenia first-admission index had a significant correlation with the suicide rate.

Application of stepwise regression analysis to the data obtained by dividing Helsinki into 37 research areas resulted in a model where seven variables sufficed to explain 60.6 per cent of the variance of the suicide rate in 1970–71. The model included two variables reflecting people's family and dwelling conditions ("people belonging to multi-person households" and "overcrowded dwelling units"), one mental health variable ("schizophrenia"), two socio-economic position variables ("social group III" and "social group IV"), one variable describing the composition of the population ("percentage of adult males") and one variable indicating the location of the residential area ("distance from the centre").

When a stepwise regression analysis was carried out with the same variables but using the division of Helsinki into 27 research areas, the model reduced to one involving only three variables: "schizophrenia", "distance from the centre" and "overcrowded dwelling units". These variables explained 48.3 per cent of the variance of the suicide rate variable.

The regression analyses showed, better than the correlations of individual variables with the suicide rate, how this rate depended on the variables describing the populations of the various parts of the city. Just as the models for 1960–61, the models for 1970–71 involved, as the central explanatory variables, a variable indicating the location of the people's living environment, a variable indicating the frequency of persons admitted to hospital for schizophrenia, and a variable indicating the percentage of people belonging to families (or, conversely, that of people living alone) in the population. Thus, there was a tendency for the suicide rates to be comparatively low in suburban areas, in areas where families with children were more frequent than elsewhere and in areas where mental disturbances were relatively infrequent.

Despite the fact that the change in the suicide rate had rather low correlations with the various variables used to characterize demographic changes, these variables were jointly able to explain in stepwise regression analysis over half of the variance of the suicide rate: five variables, namely, "growth in adult population", "decline in the percentage of persons living alone", "rise in the percentage of persons belonging to social group II", "rise in the percentage of persons belonging to social group IV" and "rise in the percentage of industrial workers" explained 49.8 per cent in all of the variance of the suicide rate.

As the study clearly revealed that suicides were distributed unevenly between the various parts of Helsinki, recourse was had to factor analysis with the view to forming of the background variables a comparatively small number of basic dimensions (factors). Employing grouping analysis, the research areas were classified into larger wholes in terms of these factors. Of the four factors obtained, one described disintegration, another well-being, a third one demographic change amounting to growth in the passive sections of the population and the fourth one tendencies toward slum-formation. When the 37 research areas were classified in terms of these factors into a number of inwardly homogeneous groups, two groups of areas were obtained such that, in one group (comprising Research Areas 2, 4, 8, 16 and 25) the suicide rate was five times the rate for the other (Research Area 54). The group of areas where the suicide rates were high was characterized by high positive scores on both the disintegration and slum-formation factors. On the other hand, distinctive features of the group typified by a low suicide rate were numerically high negative values on the disintegration and slum-formation factors and, in addition, a high positive value on the demographic change factor (growth in the passive sections of the population). It is also interesting to note that the frequency of mental disturbances, as measured by means of hospital admissions, were over twice as high in the former than in the latter group, and that in the case of first admissions for schizophrenia the difference was as large as fourfold.

The result of the grouping analysis strongly supported the hypotheses that high suicide rates are associated with low levels of integration (the integration factor) and with disintegrative changes (the slum-formation factor). On the

other hand, the hypothesis of an inverse relationship between suicide rates and well-being finds only partial support in the results.

If only the relationship of the demographic change factors to groups of areas with different suicide rates is considered, it is found that changes in the direction of slum-formation are associated with high or comparatively high suicide rates, whereas changes amounting to growth in the passive section of the population tend to be associated with low or comparatively low suicide rates.

All the high-rate and low-rate area groups were analysed in detail by means of factor and grouping analysis, in order to find out how homogeneous these areas were and whether various types of areas with high suicide rates and low suicide rates could be identified. The central factors capable of grouping the areas were the regeneration – lack of regeneration dimension and the well-being dimension. In the case of the areas where the rates were either among the very highest or the very lowest the grouping was comparatively clear-cut. The areas where suicide rates were very high were districts in Inner Helsinki characterized by lack of regeneration and a high sex (male/female) ratio. The areas, by contrast, where suicide rates were very low were suburban districts typified by regeneration and absence of a high sex (male/female) ratio. If those areas, too, where the suicide rates were either comparatively high or comparatively low are subjected to analysis, however, the total picture becomes more complex. In that case we meet areas of comparatively high suicide rates that are typified by regeneration; and, on the other hand, areas of comparatively low suicide rates are met that are characterized by lack of regeneration. This finding is very compatible with such a view of suicide that a suicide is invariably the result of a multitude of factors and that the variations in suicide rates can be explained in terms of community level phenomena only to a very limited extent. The impact of the community level on suicide rates will be evident under "extreme" conditions, whereas in other circumstances it may be overshadowed by the effects of other factors. This view also implies a certain qualification regarding the hypotheses put forward at the beginning of this study. They have to be conceived of as relating to certain community level influences, and not as furnishing a foundation for a general theory designed to explain suicide; as a matter of fact, to arrive at such a theory it will also be necessary at the same time to consider both small-group and individual level phenomena.

The grouping analysis was also intended to test the extent to which the suicide rate could be used as an indicator of the psychosocial well-being of the population. The connections of the suicide rate with the social environment were described above without paying attention to the mental health variables. In reporting the results of this study it was shown how the first-admission rates for schizophrenia are significantly higher in areas where suicide rates are high than in areas where these rates are low. In this respect the finding is

consistent with expectations. On the other hand, the picture obtained in considering the relationship between psychiatric hospital admissions and suicide rates in general (Table 61) is somewhat different. When attention is paid only to the areas having the very highest and the very lowest suicide rates, the correlation is distinctly positive. If more areas are included in the analysis, cases will be met where the suicide rate for the area is high but mental disturbances are infrequent and, on the other hand, cases where the suicide rate is low but mental disturbances are frequent. The division will thereby be clearly based on the area's degree of regeneration and well-being: mental disturbances are infrequent in areas characterized by regeneration and well-being, irrespective of whether the suicide rates for them are high or low. Moreover, the areas of this kind met in the present study were suburban areas. It is important to realize that there are areas having low suicide rates, typified by lack of regeneration and absence of well-being, where disturbances of mental health are frequent. Thus, the present analysis, too, yielded a result showing that the original hypothesis according to which high suicide rates tend to be connected with high frequencies of mental disturbances is tenable under extreme conditions but that the picture becomes more complicated under different kinds of circumstances.

SUMMARY OF PARTS I AND II

The study reported here is part of the author's more extensive suicide research project concerning suicides in Helsinki in the years 1960-61 and 1970-71. Part I of the study considers critically the frequency of suicides and the reliability of suicide statistics. Part II considers suicides as a community level phenomenon, relative to an urban environment and changes in it.

Part I of the study examines the reliability and comparability of the suicide statistics for Helsinki from the years 1960-61 and 1970-71. One aim in it was also to form two groups of suicides, comprising all suicides committed in 1960-61 and 1970-71 respectively, for the purposes of a more extensive suicide research project. Initially, two hypotheses were formulated: it was assumed that the official suicide statistics do not provide a reliable picture of the frequency of suicides and that, in consequence, they do not offer a sufficiently dependable basis for research; and, secondly, that the statistics for the two research periods are not comparable. To investigate these points a case-study type of examination was conducted concerning each of the deaths due to accidents, homicides and suicides and cases of death that had remained undetermined in Helsinki in the years concerned. The cases from the years 1960-61 to be investigated numbered 833, those from the years 1970-71 numbering 998. In each case of death the likelihood of suicide was evaluated on the basis of the police investigation data, medico-legal examination, hospital and other comparable case records and other documents employing a five-category certainty-of-suicide rating scale.

The correspondence between the official suicide statistics and the results of this study proved unexpectedly close. Changes were made in 6.2 per cent of the 1960-61 cases and in 7.3 per cent of the 1970-71 cases of suicide. A majority of the changes were, however, due to differences in evaluation implied by the evaluation method employed. Actual errors were met, according to the evaluation carried out, in 4.0 per cent of the 1960-61 cases and in no more than 0.8 per cent of the 1970-71 cases.

Of the 1960-61 cases of death ascribed to accidents, 1.6 per cent were regarded as cases of suicide, the corresponding figure for the similar 1970-71 cases being only 0.1 per cent. The introduction of a new "undetermined" mode of death resulted in an estimated fall of 6 per cent in the 1970-71 suicide

statistics in comparison with the years 1960–61.

Thus the official suicide statistics of Helsinki for the years 1970–71 must be considered comparatively reliable. The official practice observed in the classification of cases of death as suicides is comparatively stringent, however, leading to a degree of underestimation. On the other hand, official statistics therefore include few "false positive" observations, and thus they can be used, subject to certain reservations, as a basis of suicidological research.

On the basis of the results, two groups were formed, comprising all the suicides committed in Helsinki in 1960–61 and in 1970–71 respectively. The former group came to include 276 and the latter 273 suicides, the corresponding suicide rates being 30.4 and 26.7 respectively. Thus a fall of 12 per cent took place in the suicide rate between the two research periods.

Part II considers the distribution of the above two groups of suicides between various parts of Helsinki in 1960–61 and 1970–71 and investigates the relationship between suicide rates and social environments in the various parts of the city. Particular attention was given to the way in which changes in the urban environment were reflected in suicide rates. The social environments were described employing variables based on the 1960 and 1970 census data and variables indicating the psychiatric morbidity of the population.

In 1960–61 suicides, and particularly those committed by men, tended to concentrate in the central parts of Helsinki. Moreover, the distribution of the suicides between the various districts of the city was notably uneven. The suicide rate correlated significantly with the percentage of persons living alone, that of the adult population (infrequency of children), the percentages of women (sex ratio: female/male), of old people and subtenants. The suicide rate also correlated with the shortness of the distance of the district from the centre of the city. And it correlated positively with the percentage of persons belonging to the lowest social group and negatively with that of persons belonging to the highest social group. These correlations were not, however, particularly high. The psychiatric hospital admission rate variables, used to characterize the mental health of the population, also bore positive correlations to the suicide rate, but these correlations, too, were lower than expected. Stepwise regression analysis was used to examine the extent to which the variation in the suicide rate could be accounted for by the variables used. It was found that the percentage of adults (or that of children), the sex (female/male) ratio, the relative absence of people belonging to social group I and first admissions for schizophrenia sufficed to explain 35 to 45 per cent of the variance of the suicide rate.

The distribution of suicides between the various parts of Helsinki in 1970–71 was clearly different from the pattern observed in 1960–61. Suicides committed by men had "shifted" to a notable extent from the main city area, or Inner Helsinki, to the suburban areas of Outer Helsinki; in the case of women, by contrast, suicides still showed a tendency toward concentrating in the central

parts of the city. Another notable change was that both the absolute number of suicides committed by, and the suicide rate for, persons poorly integrated with the community and belonging to the non-permanent population of Helsinki had diminished by almost half, and that a fall of the same order of magnitude had also occurred in the suicide rate for this section of the population. The distribution of suicides between the various districts of Helsinki was far more even in 1970–71 than it had been in 1960–61. Suicides had decreased in areas where the suicide rates had previously been high and increased in areas where the rates had been low.

In 1970–71 the suicide rate correlated with the variables describing the social environment of the population less strongly than in 1960–61, though the correlations were in the same direction on both occasions. The suicide rate still had a negative correlation with the distance of the area from the centre of the city and, also, with the percentage of persons living in recently constructed buildings. The proportion of the variance of the suicide rate accounted for by the other variables in stepwise regression analysis was 61 per cent. The variables included in the model were the distance from the centre, schizophrenia, overcrowded dwellings, people belonging to multi-person households, social group III, social group IV and the proportion of industrial workers in the population. The model involving the first three of these variables was sufficient to explain 48 per cent of the variance.

The changes observed in suicide rates did not correlate particularly strongly with any of the variables used to characterize demographic changes. Considered jointly, however, these variables were able to explain 50 per cent of the variation in the change in the suicide rate between 1960–61 and 1970–71.

Starting from the variables used to describe the social environments in 1970–71, four basic dimensions (factors) were formed by means of factor analysis, and the research areas were grouped thereafter in terms of these factors into inwardly homogeneous research area groups. The four factors were: a disintegration factor, a well-being factor, a demographic change factor reflecting growth in the passive sections of the population and a demographic change factor reflecting tendencies toward slum-formation. When the research areas were classified into eight groups in terms of these four factors, one of the groups consisted of areas with high suicide rates and another of areas where suicide rates were low. The suicide rate for the former, or high-risk group was five times the rate for the low-risk group. The former group of areas was characterized by positive disintegration and slum-formation factor scores, whereas the latter had numerically high negative scores on these two factors and a high positive score on the demographic change factor reflecting growth in the passive sections of the population. In the group of areas where suicide rates were low the psychiatric hospital admission rates were lower by more than a half compared with the areas where suicide rates were high, and the value of the schizophrenia

first-admission rate index was less than a quarter of the corresponding value for the high-risk area group.

When factor analysis and grouping analysis were applied separately to the analysis of all the areas with high suicide rates and all the areas with low suicide rates, it proved possible to show that the areas for which the suicide rates were very high were typified by lack of regeneration, low values of the sex (female/male) ratio and location in Inner Helsinki (i.e., in the main city area), whereas the areas for which the suicide rates were very low were typified by regeneration, high values of the sex (female/male) ratio and location in Outer Helsinki (i.e., in the suburban parts of the city). When areas with only relatively high suicide rates and those with only relatively low suicide rates were also included in the comparative analysis, the differences proved less distinct. This comparative analysis also led to the identification of areas with relatively high suicide rates that were characterized by regeneration and areas with relatively low rates that were characterized by lack of regeneration.

When the frequency of occurrence of mental disturbances, as measured by hospital admissions, was examined in both the high-rate and low-rate areas, it was found that, in areas where the suicide rate was highest, mental disturbances were significantly more frequent than in areas where the suicide rate was notably low. When a larger group of areas with comparatively high and comparatively low suicide rates was subjected to examination, however, mental disturbances, except schizophrenia, were no longer distributed equally clearly in the same way as suicide rates. The area distribution of mental disturbances followed the degree of regeneration and well-being of the districts, irrespective of the suicide rate. In areas characterized by regeneration and well-being, mental disturbances were infrequent, even in cases where the area had a rather high suicide rate.

The results of Part II of the study can be considered to support the hypotheses, formulated at the beginning, that the suicide rate is inversely related to the degree of integration of the community and that integrative changes tend to decrease and disintegrative changes to increase suicides. An analysis moving at the community level has definite limitations of its own. It does not suffice in itself to furnish a basis for a general theory designed to explain suicide; on the contrary, an analysis moving both at the small-group and the individual level is necessary for that purpose. Except that the results have yielded generalizable theoretical knowledge, they may be applied to city planning, the planning of mental health services and suicide prevention in Helsinki.

APPENDIX 1

Numbers of inhabitants* and frequencies of suicide in Helsinki in 1960-61 and 1970-71, by districts

No.	Distr. No.	Distr. Name	1960-1961		1970-1971	
			Suicides	Inhabitants	Suicides	Inhabitants
1.	1.	Kruununhaka	6	13,963	10	10,632
2.	2.	Kluuvi	4	2,395	1	1,142
3.	3.	Kaartinkaupunki	5	3,512	4	1,927
4.	4.	Kamppi	14	22,107	13	16,056
5.	5.	Punavuori	6	14,090	7	11,768
6.	6.	Eira	2	2,064	2	1,725
7.	7.	Ullanlinna	8	18,376	9	15,410
8.	8.	Katajanokka	2	5,062	4	3,935
9.	9.	Kaivopuisto	0	809	0	599
10.	10.	Sörnäinen	7	5,106	2	4,418
11.	11.	Kallio	32	36,625	12	31,373
12.	12.	Alppiharju	14	21,051	10	20,219
13.	13.	Etu-Töölö	19	23,750	7	18,119
14.	14.	Taka-Töölö	11	27,534	13	21,077
15.	15.	Meilahti	8	9,808	2	7,398
16.	16.	Ruskeasuo	1	4,121	3	3,638
17.	17.	Pasila	1	2,392	3	1,679
18.	18.	Laakso	4	3,864	1	2,903
19.	19.	Mustikkamaa	0	85	0	77
20.	20.	Länsisatama	2	1,782	0	1,818
21.	21.	Hermannin	2	5,217	1	4,262
22.	22.	Vallila	15	14,554	5	12,351
23.	23.	Toukola				
	(+27.)	(+ Vanhakaupunki)	2	3,667	2	3,036
24.	24.	Kumpula	1	4,314	1	3,210
25.	25.	Käpylä	1	13,699	9	10,962
26.	26.	Koskela	0	3,208	1	3,245
27.	28.	Oulunkylä	3	17,438	11	23,144
28.	29.	Haaga	8	24,559	8	27,835
29.	30.	Munkkiniemi	10	21,589	11	21,877
30.	31.	Lauttasaari	5	18,438	7	21,299
31.	32.	Konala	1	1,479	1	5,255
32.	33.	Etelä-Kaarela	2	9,674	6	10,581
33.	34.	Pakila	1	7,115	8	8,939
34.	35.	Tuomarinkylä	0	5,073	1	4,015
35.	36.	Viikki	0	681	1	646
36.	37.	Pukinmäki	0	1,991	1	2,400

* According to the 1960 and 1970 general censuses of population respectively.

Cont.

No.	Distr. No.	Distr. Name	1960-1961		1970-1971	
			Suicides	Inhabitants	Suicides	Inhabitants
37.	38.	Malmi	3	5,883	10	15,458
38.	39.	Tapaninkylä	2	9,268	4	9,833
39.	40.	Suutarila	1	2,108	0	3,642
40.	41.	Suurmetsä	5	5,207	4	10,972
41.	42.	Kulosaari	3	3,665	1	5,089
42.	43.	Herttoniemi	3	24,476	15	23,872
43.	44.	Tammisalo	0	1,326	1	1,872
44.	45.	Vartiokylä	2	6,423	12	32,082
45.	46.	Pitäjänmäki	1	7,413	2	7,492
46.	47.	Mellunkylä	1	2,772	3	24,512
47.	48.	Vartiosaari				
	(+50.)	(+Villinki)	0	49	0	51
48.	49.	Laajasalo	1	2,971	4	9,930
49.	51.	Santahamina				
	(+53.)	(+Ulkosaaret)	0	943	1	968
50.	52.	Suomenlinna	4	1,671	0	1,350
51.	54.	Vuosaari*	0	0	5	14,714

* Vuosaari was joined to Helsinki only after 1961. In this study it has been considered in combination with Mellunkylä (District 47) as if the two had formed a single area even in 1960-61.

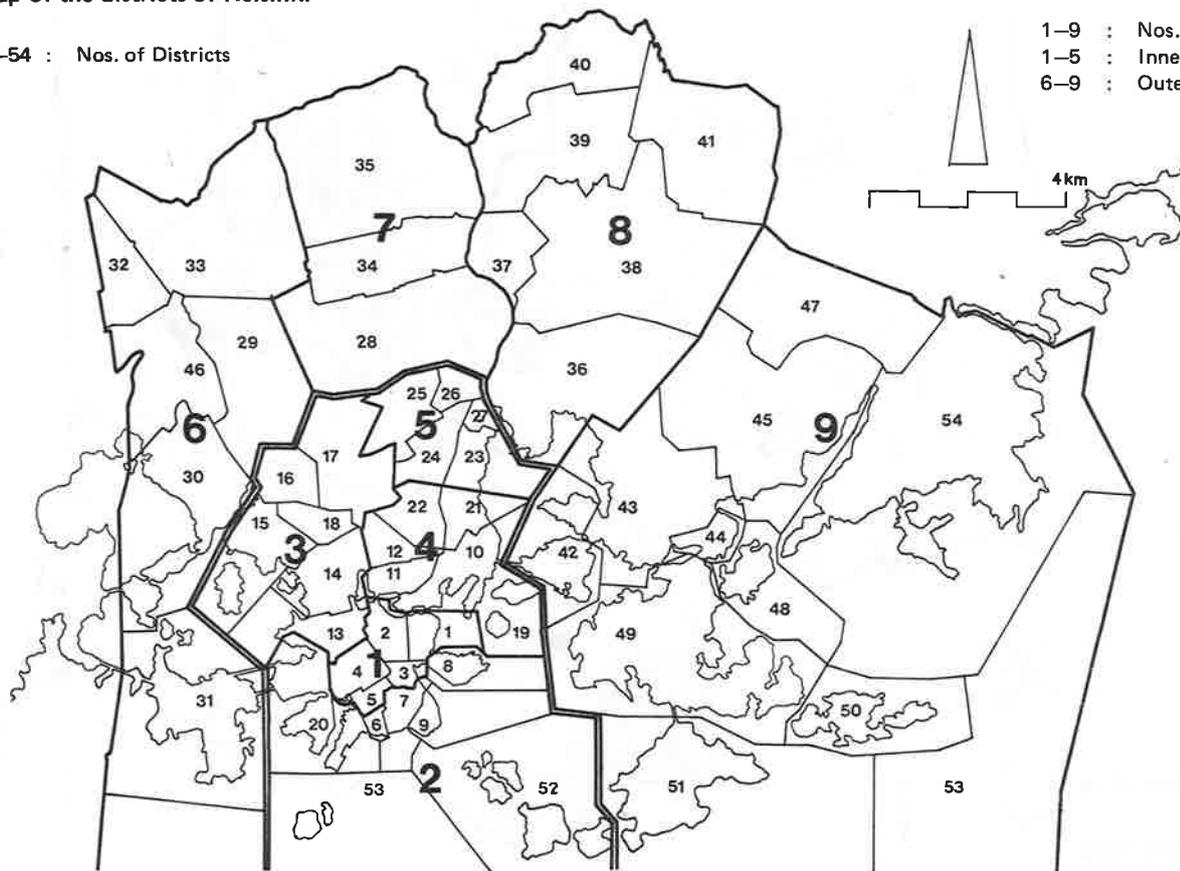
The Large Areas of Helsinki

Large areas	Districts No.
1. City Centre	1-5
2. Southern Inner Helsinki	6-9,20,52
3. Western Inner Helsinki	13-18
4. Eastern Inner Helsinki	10-12,19,21-22
5. Northern Inner Helsinki	23-27
Total Inner Helsinki	1-27,52
6. Western Outer Helsinki	29-33,46
7. Northern Outer Helsinki	28,34-35
8. North-Eastern Outer Helsinki	36-41
9. Eastern Outer Helsinki	42-45,47-51,54
Total Outer Helsinki	28-51,54

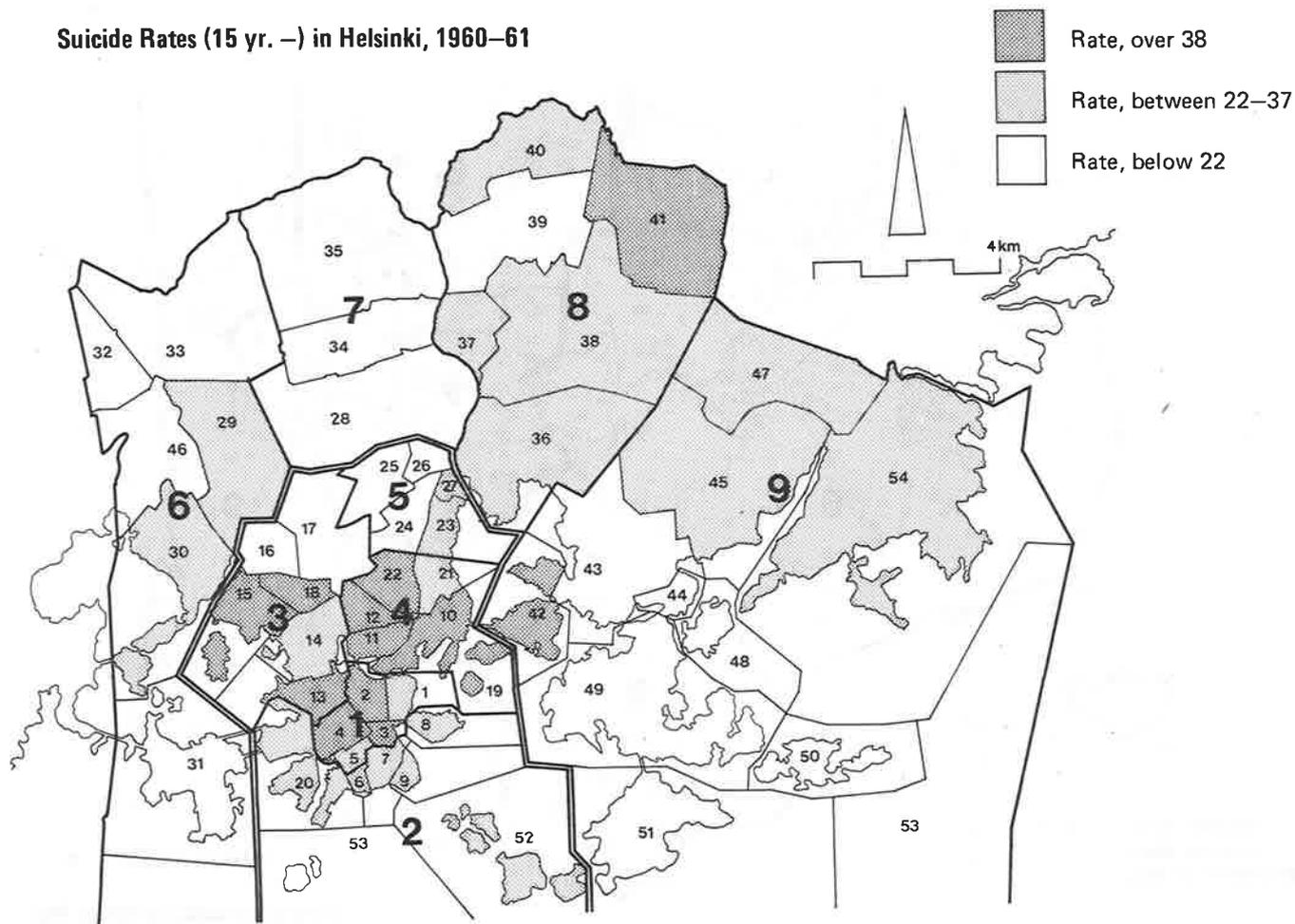
Map of the districts of Helsinki

1-54 : Nos. of Districts

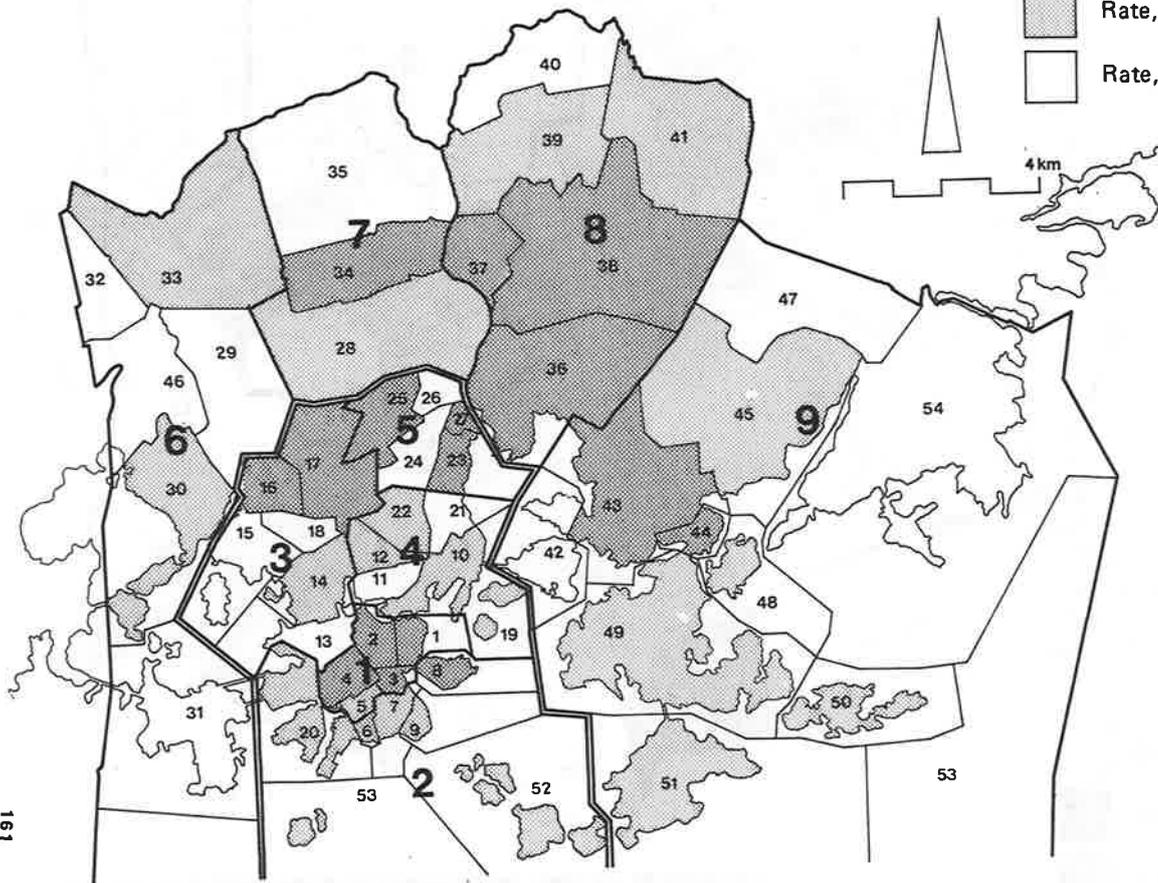
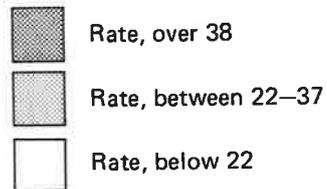
1-9 : Nos. of Large Areas
1-5 : Inner Helsinki
6-9 : Outer Helsinki



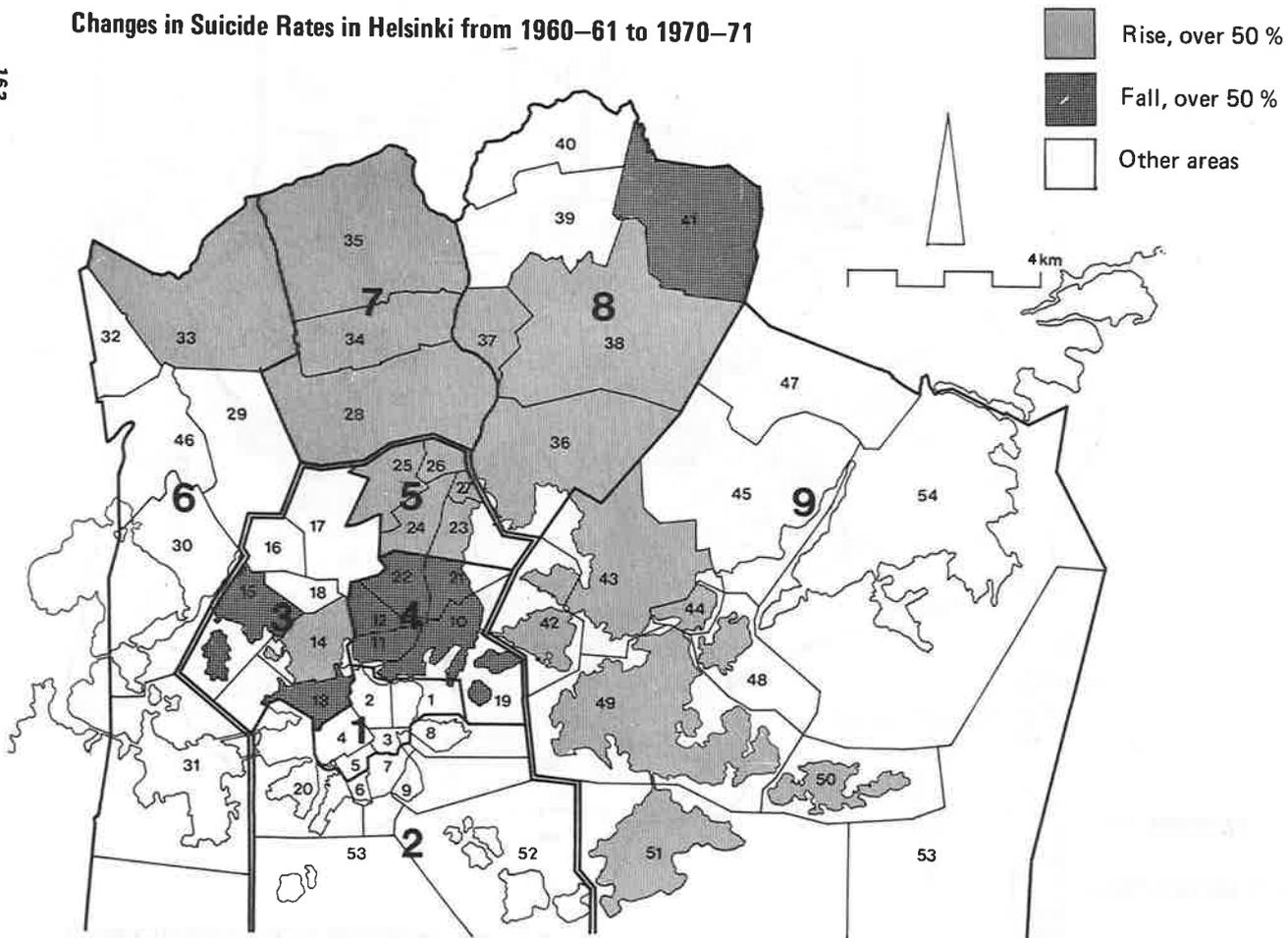
Suicide Rates (15 yr. -) in Helsinki, 1960-61



Suicide Rates (15 yr.—) in Helsinki, 1970–71



Changes in Suicide Rates in Helsinki from 1960–61 to 1970–71



APPENDIX 2

Factor analysis of observations on 48 variables for the 37 research areas:
four-factor varimax solution

Var.	Factor loadings				Communalities
	I	II	III	IV	
1.	-0.871	0.085	0.099	-0.189	0.811
2.	-0.890	0.234	0.154	-0.087	0.875
203.	-0.130	0.180	0.423	-0.358	0.356
234.	-0.662	0.035	0.192	-0.464	0.691
271.	-0.847	-0.366	-0.119	0.166	0.893
272.	0.888	-0.017	0.124	0.362	0.935
273.	-0.887	-0.456	-0.045	0.638	0.624
274.	0.863	0.084	0.065	0.311	0.852
275.	0.031	-0.268	0.103	0.649	0.504
276.	0.876	0.110	-0.359	0.065	0.852
277.	0.031	0.903	0.095	0.030	0.826
278.	0.023	0.670	0.515	-0.128	0.731
279.	-0.212	-0.896	-0.081	-0.032	0.856
280.	0.216	-0.793	-0.410	0.033	0.845
281.	0.397	0.704	0.102	0.091	0.672
282.	0.040	-0.132	0.053	0.405	0.188
283.	0.071	0.438	-0.104	-0.001	0.208
284.	0.387	0.025	-0.162	0.153	0.200
285.	0.087	-0.283	-0.134	0.004	0.105
286.	0.466	-0.456	0.390	0.306	0.870
287.	0.917	-0.064	0.132	0.119	0.876
288.	-0.832	0.167	-0.404	-0.253	0.948
289.	0.475	-0.414	-0.065	0.254	0.466
290.	-0.257	-0.927	-0.055	0.113	0.942
291.	0.341	-0.617	0.297	0.082	0.591
292.	-0.950	0.091	0.052	-0.099	0.923
293.	-0.649	-0.255	-0.239	0.124	0.558
294.	-0.752	0.060	0.039	-0.500	0.821
295.	-0.697	-0.059	0.033	-0.572	0.818
304.	0.847	0.366	0.119	-0.166	0.893
305.	-0.888	0.017	-0.124	-0.362	0.935
306.	0.932	0.181	0.144	0.082	0.929
307.	0.904	0.182	0.030	0.083	0.891
308.	0.031	0.923	0.215	-0.009	0.900
309.	-0.323	0.163	0.021	-0.085	0.139
311.	0.037	-0.153	-0.882	-0.028	0.804
312.	0.172	0.112	0.297	0.656	0.560
313.	0.291	0.094	0.680	0.465	0.772
314.	-0.481	-0.340	0.015	-0.470	0.569
315.	-0.330	-0.122	0.138	-0.546	0.441
316.	0.491	0.383	-0.139	0.338	0.521
317.	0.124	0.196	0.180	0.645	0.505
318.	-0.181	-0.107	0.193	0.024	0.082
319.	-0.314	-0.092	-0.467	-0.136	0.344
320.	0.608	0.008	0.344	0.122	0.503
322.	0.607	0.153	-0.388	0.186	0.577
348.	-0.385	-0.027	0.210	-0.701	0.684
350.	-0.037	0.153	0.882	0.028	0.804
Sums of squares	15.007	7.253	4.218	4.979	31.458

**The 48 variables included in factor analyses and grouping analyses, describing the research areas
and their population in 1970**

Variable		Min.	Max.	Mean	SD
No.	Name				
1.	Number of large area (distance from centre)	1.0	9.0	5.2	2.6
2.	Inner Helsinki – Outer Helsinki	0.0	1.0	0.5	0.5
203.	Population	2903.0	39226.0	13535.3	9612.6
234.	Area (hectares)	54.0	2248.0	489.6	540.1
271.	Men, per 1000 pop.	357.2	496.4	441.8	33.8
272.	Adults, 15–, per 1000 pop.	669.2	937.8	815.9	59.9
273.	Men, 15–, per 1000 pop.	307.8	423.1	347.7	25.4
274.	Adults, 30–, per 1000 pop.	401.5	639.3	532.6	56.2
275.	Men, 30–, per 1000 pop.	182.3	269.4	218.0	19.6
276.	Old people, 65–, per 1000 pop.	28.5	205.7	106.6	44.6
277.	Social group I, per 1000 pop.	29.0	495.2	186.8	111.4
278.	Social group II, per 1000 pop.	151.1	290.0	219.2	34.4
279.	Social group III, per 1000 pop.	193.0	585.7	425.9	95.8
280.	Social group IV, per 1000 pop.	46.0	214.3	127.8	44.1
281.	Swedish-speaking, per 1000 pop.	30.5	248.5	104.4	58.1
282.	Schizophrenia first-admission index	0.0	79.3	19.7	18.6
283.	Private psychiatric hospital admission rate	0.0	113.0	26.9	26.3
284.	University psychiatric hospital admission rate	0.0	173.1	52.4	38.0
285.	Municipal psychiatric hospital admission index	0.0	138.1	37.4	32.9
286.	Economically active, per 1000 pop.	457.2	600.5	538.9	37.9
287.	Persons living alone, per 1000 pop.	47.2	300.0	164.4	80.7
288.	Large households (over 5 persons), per 1000 pop.	11.6	64.3	31.7	13.6
289.	Subtenant households, per 1000 pop.	20.4	90.7	48.7	23.4
290.	Industrial workers, per 1000 pop.	47.4	244.7	151.3	55.5
291.	Overcrowded dwelling units, per 1000 pop.	5.2	49.7	16.9	10.0

292.	People belonging to multi-person households, per 1000 pop.	597.7	912.8	757.4	96.4
293.	Persons living in 1-2-dwelling buildings, etc. per 1000 pop.	0.7	828.9	145.4	209.8
294.	Persons living in buildings completed in 1960 or later, per 1000 pop.	0.0	898.9	306.0	267.8
295.	Persons living in buildings completed in 1965 or later, per 1000 pop.	1.6	875.4	137.0	210.2
304.	Women, per 1000 pop.	503.6	642.8	558.2	33.8
305.	Children, 0-14 yr, per 1000 pop.	62.2	330.8	184.1	60.0
306.	Women, 15-, per 1000 pop.	357.4	595.9	468.2	59.2
307.	Women, 30-, per 1000 pop.	219.2	434.0	314.6	53.1
308.	Social groups I and II, per 1000 pop.	180.1	719.8	406.0	134.4
309.	Persons living in buildings completed in 1960-64, per 1000 pop.	0.3	692.5	169.0	167.6
311.	Men, per 1000 pop.; change 1960 to 1970 ^a	-36.3	49.0	-3.4	14.9
312.	Adults (15-), per 1000 pop.; change 1960 to 1970 ^a	-124.8	178.0	48.3	49.8
313.	Old people (65-) per 1000 pop.; change 1960 to 1970 ^a	-96.9	88.1	29.9	29.2
314.	Social group I, per 1000 pop.; change 1960 to 1970 ^a	-91.2	143.4	2.1	51.4
315.	Social group II, per 1000 pop.; change 1960 to 1970 ^a	-37.1	63.9	-4.2	21.9
316.	Social group III, per 1000 pop.; change 1960 to 1970 ^a	-135.7	66.2	-11.9	45.4
317.	Social group IV, per 1000 pop.; change 1960 to 1970 ^a	-115.6	17.3	-26.2	27.0
318.	Swedish-speaking, per 1000 pop.; change 1960 to 1970 ^a	-81.1	2.8	-28.0	18.3
319.	Economically active, per 1000 pop.; change 1960 to 1970 ^a	-28.9	374.7	-22.0	65.0
320.	Living alone, per 1000 pop.; change 1960 to 1970 ^a	-21.6	65.1	24.8	24.0
322.	Industrial workers, per 1000 pop.; change 1960 to 1970 ^a	-208.9	-2.0	-116.6	46.3
349.	Population; change 1970/1960 ^b	-480.4	13150.8	530.1	2274.8
350.	Women, per 1000 pop.; change 1960 to 1970 ^a	-49.0	36.3	3.4	14.9

a) In permilleage points.

b) In per mill.

**Factor analysis of observations on 48 variables for the 10 high-rate areas:
four-factor varimax solution**

Variables	Factor loadings				Communalities
	I	II	III	IV	
1.	-0.597	-0.223	0.342	0.659	0.957
2.	-0.789	-0.208	0.000	0.467	0.898
203.	-0.208	-0.271	0.063	0.500	0.370
234.	-0.709	-0.450	0.173	0.104	0.746
271.	-0.697	0.580	-0.108	0.206	0.876
272.	0.815	0.417	-0.212	-0.327	0.991
273.	0.106	0.854	-0.308	-0.156	0.860
274.	0.883	0.326	0.141	-0.138	0.925
275.	0.146	0.709	-0.024	0.271	0.598
276.	0.732	0.280	-0.315	-0.133	0.731
277.	0.119	0.020	-0.907	0.069	0.842
278.	-0.179	-0.251	0.193	0.811	0.790
279.	-0.340	-0.095	0.817	0.171	0.823
280.	0.244	0.014	0.117	-0.834	0.769
281.	0.534	0.251	-0.495	-0.508	0.851
282.	0.115	0.558	0.671	0.120	0.790
283.	0.037	0.101	0.381	-0.211	0.201
284.	0.123	0.184	-0.623	-0.308	0.532
285.	0.195	0.291	0.207	0.432	0.352
286.	0.346	0.229	0.052	-0.819	0.847
287.	0.499	0.465	-0.323	-0.524	0.844
288.	-0.770	-0.369	-0.068	0.444	0.931
289.	0.194	0.479	-0.548	-0.527	0.845
290.	-0.296	0.464	0.732	0.012	0.839
291.	0.233	-0.015	0.294	-0.692	0.619
292.	-0.502	-0.510	0.425	0.472	0.916
293.	-0.674	0.119	0.097	0.318	0.579
294.	-0.920	-0.241	0.140	0.185	0.958
295.	-0.948	-0.142	0.127	0.149	0.957
304.	0.697	-0.580	0.108	-0.206	0.876
305.	-0.815	-0.417	0.212	0.327	0.991
306.	0.905	-0.103	-0.040	-0.288	0.914
307.	0.849	-0.067	0.161	-0.301	0.841
308.	0.043	-0.083	-0.804	0.397	0.814
309.	-0.817	-0.325	0.143	0.209	0.837
311.	0.169	0.746	0.224	-0.415	0.808
312.	0.412	-0.021	0.583	0.571	0.837
313.	0.638	0.277	0.124	0.559	0.812
314.	-0.779	0.095	-0.176	-0.203	0.688
315.	-0.738	0.058	0.136	0.003	0.567
316.	0.724	-0.112	-0.197	0.177	0.607
317.	0.696	-0.317	0.315	0.294	0.771
318.	-0.057	0.264	-0.042	0.757	0.647
319.	0.121	-0.314	0.684	-0.032	0.582
320.	0.428	0.319	0.505	0.041	0.542
322.	0.434	0.277	-0.757	-0.245	0.898
349.	-0.833	-0.254	0.163	0.165	0.813
350.	-0.169	-0.746	-0.224	0.415	0.808
Sums of squares	15.442	6.440	7.214	7.791	36.888

**Factor analysis of observations on 48 variables for the 14 low-rate areas:
four-factor varimax solution**

Variables	Factor loadings				Communality
	I	II	III	IV	
1.	0.927	0.132	-0.217	-0.059	0.926
2.	0.895	0.284	0.083	0.047	0.891
203.	0.189	0.178	0.288	-0.505	0.406
234.	0.648	-0.087	0.083	-0.638	0.842
271.	0.946	-0.267	0.002	0.130	0.982
272.	-0.837	-0.027	0.248	0.327	0.870
273.	0.536	-0.373	0.279	0.619	0.887
274.	-0.918	0.078	0.064	0.171	0.883
275.	0.385	-0.133	0.434	0.576	0.643
276.	-0.878	0.052	-0.330	0.074	0.890
277.	0.087	0.968	0.041	0.083	0.953
278.	-0.130	0.669	0.381	-0.358	0.738
279.	0.105	-0.985	-0.004	-0.037	0.983
280.	-0.198	-0.833	-0.365	0.120	0.880
281.	-0.247	0.916	-0.065	0.082	0.912
282.	0.177	-0.122	0.307	0.108	0.150
283.	0.021	0.675	-0.337	0.216	0.616
284.	-0.498	-0.258	0.002	0.037	0.316
285.	-0.126	-0.294	0.171	0.133	0.149
286.	-0.092	-0.335	0.808	0.171	0.802
287.	-0.886	0.115	0.383	0.009	0.945
288.	0.706	0.056	-0.060	-0.137	0.956
289.	-0.181	-0.454	0.335	0.286	0.433
290.	0.337	-0.924	0.030	0.101	0.978
291.	-0.041	-0.415	0.497	0.313	0.519
292.	0.983	0.025	-0.029	-0.036	0.970
293.	0.524	-0.447	-0.214	0.314	0.618
294.	0.775	0.270	-0.289	-0.265	0.828
295.	0.678	-0.053	-0.019	-0.695	0.946
304.	-0.946	0.267	-0.002	-0.130	0.982
305.	0.833	0.027	-0.249	-0.327	0.870
306.	-0.945	0.106	0.126	0.072	0.926
307.	-0.959	0.106	-0.045	0.020	0.932
308.	0.040	0.977	0.133	-0.024	0.974
309.	0.276	0.434	-0.375	0.424	0.585
311.	0.049	-0.046	-0.948	0.158	0.929
312.	-0.394	-0.042	0.407	0.662	0.761
313.	-0.209	0.104	0.899	0.128	0.878
314.	0.691	-0.394	-0.130	-0.397	0.792
315.	0.679	-0.012	-0.359	-0.417	0.764
316.	-0.731	0.435	-0.002	0.262	0.792
317.	-0.366	0.081	0.569	0.553	0.760
318.	0.191	-0.356	0.073	0.068	0.174
319.	0.143	-0.197	-0.727	-0.038	0.589
320.	-0.644	0.266	0.308	0.099	0.589
322.	-0.725	-0.058	-0.392	0.270	0.756
349.	0.467	0.015	-0.034	-0.833	0.913
350.	-0.049	0.046	0.948	-0.158	0.929
Sums of squares	16.391	8.364	7.092	4.968	36.815

APPENDIX 3

List of basic variables

1. Number of Large area (indicating the distance from the centre; see the map in Appendix 1)
2. Inner Helsinki – Outer Helsinki (see Appendix 1)
3. Population, 1970
4. Suicides, 1970–71
5. Number of men, 1970
6. Male suicides, 1970–71
7. Population, 15 yr – , 1970
8. Number of men, 15 yr – , 1970
9. Population, 30 yr – , 1970
10. Number of men, 30 yr – , 1970
11. Population, 65 yr – , 1970
12. Number of persons belonging to social group I, 1970
13. Number of persons belonging to social group I, 1970
14. Number of persons belonging to social group III, 1970
15. Number of persons belonging to social group IV, 1970
16. Number of Swedish-speaking persons, 1970
17. Schizophrenic Helsinki patients (random sample of 98 patients), first admitted to psychiatric hospital in 1970
18. Number of Helsinki persons admitted to a private psychiatric hospital in 1970
19. Number of Helsinki persons admitted to University Psychiatric Clinic for treatment in 1970
20. Patients under treatment at the psychiatric acute hospital of the Municipality of Helsinki (systematic sample of 177 patients) in 1970
21. Economically active population, 1970
22. Number of persons living alone, 1970
23. Households of over 5 persons, 1970
25. Subtenant households, 1970
26. Number of industrial workers, 1970
30. Overcrowded dwelling units, 1970
31. Number of people belonging to multi-person households, 1970
32. Number of persons living in 1-2-dwelling buildings and terrace or row houses, 1970
33. Number of persons living in buildings completed in 1960 or later, 1970
34. Area of district (hectares), 1970
35. Number of persons living in buildings completed in 1965 or later, 1970

36. Population, 1960
37. Suicides, 1960–61
38. Number of men, 1960
39. Male suicides, 1960–61
40. Population, 65 yr — , 1960, % of total population
41. Population, 15 yr — , 1960
42. Persons belonging to social group I per 1000 inhabitants, 1960
43. Persons belonging to social group II per 1000 inhabitants, 1960
44. Persons belonging to social group III per 1000 inhabitants, 1960
45. Persons belonging to social group IV per 1000 inhabitants, 1960
46. Swedish-speaking persons per 1000 inhabitants, 1960
47. Economically active population, 1960
48. Number of persons living alone, 1960
49. Subtenants, 1960
51. Number of industrial workers, 1960
52. Number of persons who had passed the matriculation examination (necessary for university-level studies), 1960
53. Persons who had been under hospital treatment for schizophrenia, per 100,000, 1960
54. Persons who had been under hospital treatment for psychosis, per 100,000, 1960
55. Persons who had been under hospital treatment for alcohol or drug abuse, per 100,000, 1960
56. Persons who had been under psychiatric hospital treatment, per 100,000, 1960

Additional variables were formed during the various stages of the study on the basis of these variables 1–52.

APPENDIX 4

Some brief reports on cases in which the mode of death was changed.

Case 1

Certain suicide — officially an undetermined death

The decedent was a 23-year-old unmarried woman with a history of abuse of various drugs and narcotics. The abuse had been of several years' duration. For her last two or three years she had been under almost continuous psychiatric treatment in several hospitals. The treatment results had been rather immaterial. She was still hospitalized on the last day of her life but was facing discharge from the hospital due to unremitting abuse of drugs and protracted hospital stay. She had previously attempted suicide several times. During the last few weeks she had often talked about suicide with her therapist. She left the hospital to go on some errands in town, but in the afternoon she rented a room in a cheap hotel. In the evening she ordered a bottle of water. The next day the cleaning woman found her lying dead on the floor. She had locked herself up. Beside her body on the floor there were three empty barbiturate bottles and an empty hypodermic syringe. There were fresh needle marks on the back of her hand. Examination of her liver tissue revealed a heavy concentration of barbiturates.

Case 2

Almost certain suicide — officially an accidental death

The decedent was a 25-year-old married woman who did not have any children. She was found drowned in the bathtub in her home. The bathtub was filled up to the rim with water. When her husband was returning home from work he found that the front door had been barricaded with two heavy armchairs so as to prevent entering the house. The bathroom door had been locked up. The wife's handbag was in the bathroom, and in it there was an empty tube which had contained ten over-the-counter sleeping pills. There were two additional empty sleeping pill containers in the bathroom. According to the relatives, prior to her death the decedent had manifested signs of depression and strange behaviour. Even earlier she had been deliberating and talking about the possibility of suicide. She had sought psychiatric treatment one month prior to her death. She paid her last visit to her psychiatrist one week before the incident. It had been agreed that the treatment was to go on. To the psychiatrist she had reported about conflicts at her job. Moreover, having had to discontinue the use

of oral contraceptives she had been afraid of becoming pregnant and she felt herself incompetent as a mother. According to clinical evaluation, her disturbance was a neurotic depression which was becoming alleviated. Autopsy revealed signs of death through drowning, and in the liver tissue evidence of a barbiturate intoxication was detected. The forensic medicine specialist decided that the most probable alternative was an accidental death as a result of having taken too many pills due to unfamiliarity with use of drugs.

Case 3

Undetermined, suicide possible — officially suicide

The decedent was a 59-year-old divorced woman who was found drowned in shallow water in a shore area hangout of skid-row alcoholics. On the shore there lay a topcoat and a bag with tablets in it. The woman had often visited a psychiatric out-patient clinic because of abuse of drugs and alcohol. However, as far as it is known she had never attempted suicide. It was not possible to obtain relevant information on the events preceding the drowning incident. Autopsy revealed blood alcohol concentration corresponding to a heavy intoxication as well as evidence of ingestion of barbiturates.

APPENDIX 5

Some characteristics of suicides (15 yrs. and over) in Helsinki in 1960-61 and 1970-71

Variable	1960-61 (N = 276)		1970-71 (N = 271)	
	Per cent	Rate	Per cent	Rate
Males	63.8		63.8	49.1
Age, 15-24	5.8		12.9	19.3
25-34	13.8		19.9	30.4
35-44	21.0		15.5	33.4
45-54	33.3		22.5	52.3
55-64	16.3		17.0	39.5
65-	9.8		12.2	31.4
Unmarried	30.1	36.9	32.1	32.8
Married	43.5	31.8	45.0	27.5
Divorced	14.9	123.9	10.3	60.2
Widowed	11.6	51.2	12.6	50.3
Social class I	12.3	18.4	14.4	19.2
Social class II	13.4	18.4	18.8	22.0
Social class III	40.6	31.7	41.7	26.6
Social class IV	33.7	74.8	25.1	56.0
Method: poisoning	42.0		41.0	
hanging	29.4		25.8	
firearms, explosives	8.0		13.6	
jumping	9.8		8.9	
drowning	6.2		6.3	
cutting, piercing	1.8		1.5	
Born in Helsinki	18.9		22.5	
Stayed in Helsinki 5 yrs.—	72.0		66.4	
Stayed in Helsinki under 3 yrs.	6.8		7.4	
History of psychiatric treatment	32.6		54.2	
Psych. treatment, last 11 mos.	18.1		42.1	
History of psych. hospitalization	26.4		45.0	
Psych. hospitalization, last 11 mos.	15.9		32.5	
Suicide during psych. hospitalization	6.9		8.1	
Psychosis	18.5		19.2	
Neurosis-character disorder	10.5		21.8	
Addiction	3.6		13.3	
No psychiatric treatment	67.4		45.8	

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