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Problems in Measuring Diachronic Religious Behavior, or Using Indicators to 'Make a Virtue of Necessity': the Case of the Netherlands (1975–2005)

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Review of Religious Research

Problems in measuring diachronic religious behavior, or using indicators to 'make a virtue of necessity': the case of the Netherlands (1975-2005)

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Response to Reviewers:	<p>Dr. Adair Lummis Editor-in-Chief Review of Religious Research</p> <p>Dear Dr. Lummis,</p> <p>I have revised the article as suggested and have had the final text reread by an English mother tongue speaker. To make it easier to check the corrections, I have also attached the text with replies to the comments made by the second reviewer. This file is named "Measuring religious behavior 02 Main file (Final with corr)".</p> <p>Best wishes</p> <p>Ettore Scappini</p>

Author Biography

Ettore Scappini is a Lecturer in Sociology at the University of Bologna. He is involved in research in the following areas: measurement problems in the social sciences; religious behavior in Western countries; education and work in the course of life and political behavior. He has published articles in international periodicals such as *Quality & Quantity* and the *Journal for the Scientific Study of Religion*.

Problems in measuring diachronic religious behavior, or using indicators to ‘make a virtue of necessity’: the case of the Netherlands (1975-2005)

Abstract

The aim of this study is to show the different advantages and drawbacks of the main quantitative indicators used in research on diachronic religious behavior. We will demonstrate that religious affiliation has to be used in long-term studies; although it is extremely imprecise, it is often available over long periods of time. Instead, the best solution for medium-term studies is to use frequency of attendance at religious services. This indicator is more accurate than religious affiliation, but is only widely available from the 1960s-1970s onwards. Finally, the most suitable indicator for short-term analysis is obtained from diary-based time-use studies. It is the most precise of the three indicators, but the source is less readily available as these surveys have only been conducted in most countries in the last 30 years. This study is based on data from Time Use Surveys conducted in the Netherlands every five years from 1975 to 2005.

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Introduction

The wide-ranging sociological debate about the evolution of religion is partly generated by the uncertainty deriving from the varying degrees of precision of the different sources used. The aim of this study is to stabilize the discussion arena by showing the different advantages and drawbacks of the main quantitative indicators used in studies of diachronic religious behavior.

The complex variety of topics addressed by researchers that specialize in the evolution of religion includes a thread of debate focused on three frequently interconnected issues¹: identifying the causes that triggered the process of secularization and when it started (De Graaf, Need, and Ultee 2004; Knippenberg 1998; 2006; Te Grotenhuis and Scheepers 2001), discovering the features of the trend and whether it is monotonic (Coleman 1978; De Graaf and Te Grotenhuis 2008; Eisinga, Felling, and Lammers 1996) and revealing the current state of this process — whether it is still increasing, has stopped or is decreasing (Greeley 2004; Lechner 1996; Stark and Iannaccone 1996).

When applying these various issues to the available data in an attempt to develop a reasoned answer, most researchers use three types of indicators: religious affiliation and frequency of attendance at religious services if the measurement tool is a questionnaire, and presence at worship if the measurement tool is a diary. As we will see, data covering a broad time span will be required to investigate the causes and start of the process of secularization. One such indicator is religious affiliation, as it was first recorded in the 19th century in census files in some countries. Despite the ‘volatility’ of this measure, affiliation is useful for studying long-term trends because it is the only indicator available for long periods of time. However, it is less valid for the more precise levels of

measurement needed to identify the exact evolution of the process. Conversely, issues regarding the development of the trend will need to be addressed using more precise — and more recent — data. One indicator of this type is frequency of attendance at religious services, which first became available in many countries in the late 1960s or early 1970s. Although it is appropriate for trend studies, it typically overestimates religious practice, often somewhat erratically. It is therefore unreliable for making short-term comparisons. Finally, revealing the current state of this process requires data with a high level of accuracy. One such indicator is presence at worship, derived from surveys that use diaries as their measurement tool. However, these data have only been widely available for the last thirty years.

With regard to the issues addressed and the resulting limitations deriving from the availability of sources, researchers need to be aware of the advantages and drawbacks of different indicators to develop appropriate considerations. In order to carry out the study, we will have to use surveys which include the aforementioned information and are repeated over time in a comparable way. This combination of features is rarely found, even in well-structured and complex surveys. Our study will use surveys conducted in the Netherlands, some of the few with these characteristics. In particular, we will use the five indicators related to religious practice used in the seven surveys carried out in the Netherlands between 1975 and 2005. The first three, collected by questionnaire, are religious affiliation, importance of religion, and frequency of attendance at religious services. The fourth, collected by diary, is presence at worship. The fifth and last indicator, calculated by a conversion process applied to the frequency item, will be useful for comparisons with the diary-based indicator. Before starting the discussion, we will present the data and clarify some aspects of the indicators used.

The data: Time Use Surveys and Longitudinal Internet Studies for the Social Sciences

We will now introduce the two data sources that will be used for the comparisons: the Time Use surveys conducted in the Netherlands, which will be used for our main analysis, and the Longitudinal Internet Studies for the Social Sciences, a panel that will be useful to make some additional assessments.

Time Use Surveys

This study will use the seven waves of the Time Use Survey (TBO) conducted every 5 years by The Netherlands Institute for Social Research (SCP) and partners from 1975 to 2005. In the survey, respondents kept a diary over a seven-day period in October, recording what they were doing (every 15 minutes) and where they were. In addition, a detailed questionnaire was completed. Each wave is representative of the entire Dutch population over 12 years of age, but for the purposes of this study, we will single out respondents aged between 18 and 74.

The response rate is generally low in the Netherlands, especially for time diaries which are time-intensive; it varied between 76 percent in 1975 and 20 percent in 1995. The most recent survey from 2005 had a response rate of 37 percent (Mandemakers and Roeters 2014). In order to minimize the potential bias of the varying low response rate, the analysis was weighted to represent the population in each survey year. However, weighting the sample is only a partial solution to the problem, as explicit refusals to take part in surveys are not neutral and may produce bias tending towards overrepresentation of levels of religious practice. In other words, it is assumed that most of those who choose not to collaborate are non-practicing (Brennan and London 2001; Ellison 1992; Morgan 1983; Woodberry 1998). Moreover, while these problems cannot be ignored in comparisons between indicators from surveys with different characteristics, the resulting

bias will not affect our comparisons, as they will be made between indicators from the same sample.

The final difficulty concerns the different level of intensity of an individual's attendance at religious services over the course of a year. Unfortunately, we have no such data about monthly variability in attendance in the Netherlands. However, October and November are the months that come closest to the yearly average figure (Harvey 1993). Therefore, we believe that our comparisons are made with a reasonable degree of approximation.

With regard to religious practice recorded in diaries, there were no changes between the years in the list of pre-coded activities. We used the code regarding acts of worship, which excludes any such behavior carried out at home. The definition of attendance that we chose to adopt to calculate presence is 'Going to church, attending a humanist gathering etc. *not at home*² *in the survey week*'.

Longitudinal Internet Studies for the Social Sciences

As we will see, in order to conduct a complete discussion we need to highlight aspects related to the temporal stability/instability of statements about belonging to a given denomination. When dealing with this issue, we need to use a panel which includes an item on religious affiliation at regular intervals. To this end, we will use the Longitudinal Internet Studies for the Social Sciences (LISS), a panel based on a true probability sample of households drawn from the population register by Statistics Netherlands. Data were collected by CentERdata from November 2007 onwards³. In this study, we will use the seven waves collected annually from 2008 to 2014. The panel is an ongoing study in which participants complete monthly online questionnaires on a variety of topics such as family, economic situation, health and religion (Scherpenzeel 2009)⁴.

Measuring church attendance: frequency versus presence

As mentioned above, we need to compare the two indicators derived from questionnaire data and daily diaries. In order to make this comparison, we have developed a suitable conversion procedure, which is outlined below.

The data typically obtained from questionnaires and diaries are fundamentally different in nature. The former can be used to determine how frequently each subject attends religious services on a weekly basis over a given period, which is usually one year. Ideally, if n is the number of weeks in the given period (generally $n = 52$), the $n+1$ values f_x can be calculated, each of which shows the number of people attending a service x times, with x ranging from 0 to 52. Each ratio f_x/N , in which N is the size of the sample, provides the weekly attendance rate for each single value or group of values of x . This rate can also assume the form of a cumulative attendance rate (hereinafter simply cumulative rate) to indicate the proportion of people who attend services at least X times — $F(X) = \sum_{x=X}^{52} f_x/N, \forall x \geq X$.

The use of diaries to determine the prevalence of worship attendance in a population involves adopting an indicator that is very different from the one derived from questionnaires that measure frequency. It is a measure that has already been analyzed in depth in other studies (Rossi and Scappini 2012; 2014). In brief, it expresses the ratio between the number of diaries that record attendance of a service and the total number of diaries completed. If we record the presence/absence ($x=1.0$) in worship attendance for

each of the N diaries in the sample, then $P_m = \sum_{i=1}^N x_i / N$ showing the ratio between positive events — $\sum_{i=1}^N x_i$ — and possible events — N . We call the indicator P_m ‘measured presence’. When the measured presence values are not specified, they will be

calculated with reference to the entire sample for the year in question. However, for some comparisons we will need to calculate presence by referring to the specific subsample analyzed, such as the stated frequency of attendance. Here, we will use the term ‘specific measured presence’.

Nevertheless, as already demonstrated (Rossi and Scappini 2012; 2014), presence is a ‘reductive’ measure as it groups together individuals with completely different attendance patterns in the same indicator, taking no account of specific distributions of events and people. For example, $P=25$ percent can be the result of each individual in a given population attending services once every four weeks or a quarter of the population attending services every week. Generally though, it is a combination of the two situations.

As it is easy to deduce, this statistic cannot be referred to individual behavior in any way. It only reflects collective behavior, as the only thing known about individual interviewees is their attendance on the day that the diary was completed. Therefore, it only establishes the degree to which a given practice is carried out within a defined social group, from which the underlying individual action cannot be inferred. In other words, it is an indicator that is relatively ‘poor’ in terms of providing information, in the sense that it cannot be used to discover the distribution of individual propensity to attend religious services.

This study will also make comparisons between questionnaire-based surveys and diary-based surveys. As we have seen, the two types of data are completely different and presence measured from diaries cannot be used to infer any information about how frequently a population attends services (see also Scappini 2010). While it is impossible to move from presence to frequency, the reverse transition can be made by using the distribution of the frequency data to calculate the attendance density.

Ideally, if there are detailed data about how the population is distributed over the different annual attendance frequencies (from 0 to 52), the spacing of the underlying events can be reconstructed and their measurements can be quantified. However, it is not realistic to subject respondents to such a detailed item about their annual attendance at religious services. It is generally preferable to offer a limited number of answer options that correspond more or less explicitly to frequency intervals. In the case under analysis here, for example, the item included in the surveys — ‘Do you sometimes go to a church, mosque or other house of prayer? If so, how often do you go on average?’ — has nine answer options: a) twice a week or more; b) once a week; c) once every 2-3 weeks; d) once a month; e) once every 2-3 months; f) once every 4-6 months; g) once every 7-12 months; h) less than once a year; i) never.

In order to convert frequency to presence, we need to sum the products of the number of people and the relative typical attendance frequency x — thereby identifying the positive events —, dividing the result by the number of possible events: in formal terms $P_c = \sum_{x=0}^{52} f_x x / (N \cdot 52)$. In this instance, we will use the term ‘calculated presence’, indicated by P_c . We therefore need to assign a typical frequency to each category x used in the formulation of the item⁵. The frequency values that we identified with $(x/52)$ and applied to the different answer options correspond to the following weights: 1) and 2) 1.000; 3) 0.413; 4) 0.231; 5) 0.096; 6) 0.048; 7) 0.026; 8) 0.010; 9) 0.00⁶.

To sum up, while P_m is a measure of church attendance directly derived from the diary data, P_c is calculated using a conversion procedure for the different questionnaire answer options. As we will see, the imprecise way in which respondents refer to the options in the latter case is a cause of significant bias. However, this feature does not affect measured presence, which is therefore much less subject to error. As a result, we

will hereinafter assume that the measured presence values are correct and will calculate an index called I_c — which provides a measure of the bias in calculated presence, in formal terms $I_c = P_c/P_m$. We will now address the object of our study, which will be developed by comparing the different religious indicators in the survey.

Comparisons between indicators: from efficient ones to those used more out of ‘necessity’ than ‘virtue’

We will start with some preliminary considerations (see Figure 1) of the yearly trends of three indicators: religious affiliation, measured presence and calculated presence. The other two indicators — importance of religion and frequency of attendance at religious services — will be analyzed below.

[Figure 1, here]

What comparisons can be made between these indicators? The values of measured and calculated presence are directly comparable, while there is no way of directly comparing affiliation with presence. In the latter case, the problem derives from the fact that affiliation and presence are indicators measuring characteristics that do not fully overlap: affiliation measures the spread of affiliates or a denomination in the population analyzed, while presence measures the average intensity of the activity conducted. We will return to this issue below to highlight some of the problems deriving from the fact that the indicators do not overlap completely.

While a direct comparison between presence and affiliation is not possible, an assessment over time can be carried out. In other words, we can ask if the outline of the trend between affiliation and presence remains the same irrespective of the initial values, or whether it changes from indicator to indicator. This assessment will be made using the

index numbers (In) presented in figure 1. For instance, we will give the indicator an arbitrary initial value, for example for $P_m=23.1$ in 1975 we will set $In=100$. This will be adjusted over time depending on the changes that occur: for example $P_m=11.8$ in 2005 will correspond to $In=51$ ($11.8/23.1*100$), from which it can be concluded that measured presence dropped by 49 per cent between 1975 and 2005.

We will start by comparing the presence data. The graph shows that the calculated presence values are much higher than the measured presence figures. We will discuss the causes and repercussions of these differences below; for the moment, we will simply state that the two indicators provide a different ‘picture’ of the prevalence of religious practice.

The situation is different with regard to the second issue — the trend over time. Analysis of the index numbers highlights that the trends of measured and calculated presence practically overlap and that there are minimal variations overall in the medium term. Finally, the trend of index numbers for religious affiliation is not very dissimilar, although it is significantly less steep with a much less dramatic drop in the prevalence of religious affiliates than the pattern derived from presence indicators⁷.

This brief analysis shows that the three indicators describe significantly different trends. To understand why, we need to examine their characteristics in more detail, highlighting their associated advantages and drawbacks.

A ‘poor’ but efficient indicator: measured presence

Measured presence is certainly the most precise indicator used in this study, as there are valid grounds for claiming that those who keep a diary have no reason to alter their position with regard to attendance at religious services (Bonke 2005; Juster and Stafford 1991; Kan and Pudney 2008; Presser and Stinson 1998). However, as shown above, this is a poor indicator, as it cannot be used to calculate the proportion of the population that

perform worship with a certain degree of regularity. Moreover, there are far fewer available data from diaries than frequency and affiliation data, as surveys using this collection method have only become widespread in the last 30 years. Finally, these surveys are extremely complex and expensive, partly because they need to be conducted using huge samples in order to measure the wide variety of behaviors in everyday life. Therefore, they can only be carried out by national institutes on a periodic basis — every five or ten years. By contrast, as mentioned above, religious affiliation has been measured by census since the 19th century in some countries. At the same time, traditional questionnaire-based surveys are conducted more frequently and therefore provide more up-to-date information, which also covers a wider time span than diary-based studies.

In conclusion, measured presence is a ‘poor’ source of information that can only be used to study the recent past. This may dissuade researchers from using it in studies on religious practice, leading them instead to use data with greater historical availability or more up-to-date information. However, it is a precise indicator and, unlike the others, it does not present any elements of structural bias except those related to data collection problems, mainly the non-response rate.

A useful but approximate indicator for long-term studies: religious affiliation

As we have seen, this indicator provides delayed approximations of variations in religious behavior. This can chiefly be explained by two factors⁸. The first of these is the fact that religious affiliation is not a one-dimensional concept, as the ‘value’ of an answer can vary: while one individual may see it as an indicator of effective adherence to a given system of beliefs, another person may only view it as a weak assertion or devoid of any real meaning (McAndrew and Voas 2011).

[Table 1, here]

In fact, the significant variability in the sequence of answers given by the panel of individuals over time can only be explained by deducing that some respondents do not ascribe great importance to declaring their religious adherence. Table 1 illustrates this point, showing that more than 20 percent of respondents changed their answer about religious affiliation at least once in the six-year period (2008-2014), with half of these varying their response more than once. If individuals attributed importance to declaring their affiliation to a particular denomination, then only a small number of respondents would vary their statements over time. Furthermore, in our case the time span analyzed is extremely brief, especially if compared to an average lifetime.

Some studies provide different explanations to those offered above, suggesting that variations in affiliated belief systems over time can be accounted for by changes in the life cycle (Wilson and Sherkat 1994), the fact that they occur as a result of important religious rites such as marriage (Need and De Graaf 2005), or the fact that they occur when religious identity is not well-defined or is 'liminal' (Lim, MacGregor, and Putnam 2010). However, it is another matter when respondents state that they belong to a given denomination intermittently over a short period. We feel that there is a more simple explanation: it can occur when some respondents see the statement of affiliation as a 'volatile' variable, something expressed without giving any importance to the stated opinion.

[Table 2, here]

This idea is strengthened by the fact that respondents can state that they belong to a denomination even if they have little interest in the issue (Table 2). In 1975 and 2005,

more than a third of religious affiliates said that religion has little or almost no importance for them — respectively 40.4 and 38.1 percent⁹. These high figures do not take account of the fact that the questionnaire includes a filter item to select all those who state that they do not belong to any religious group¹⁰. It is known that the omission of these respondents triggers an increase of up to 20 percentage points in those who say that they belong to a religious group (Eisinga and Felling 1990; Knippenberg 2010). As a result, in our case the ‘weakness’ is probably shown to a conservative degree¹¹.

[Table 3, here]

Religious affiliation is therefore a volatile indicator, as individuals can provide information that actually has little value (on this point, see also Hayward and Krause 2014; Voas 2009; 2014). This does not mean that the data collection process is inept or that respondents ‘cheat’; it simply means that, in some cases, it makes little difference to respondents whether they give one answer rather than another.

The second factor is that the general value of religious affiliation has faded over time. While average statements of adherence had a ‘definite meaning’ connected to presence at worship in the early 1970s, this relevance was much weaker in the 2000s. For example, in 1975 the measured presence of different religious affiliates was 22.2 percent, a figure which dropped to 11.4 percent in 2005 (Table 3).

[Table 4, here]

Therefore, even though there was a 30 percent reduction in the number of subjects who said that they were affiliated to a denomination between 1975 and 2005 (Table 4), the drop in measured presence was significantly higher — approximately -49 percent

(Table 3). In practice, only part of the actual process of secularization is shown by religious adherence. It is likely that this problem does not only affect this indicator, but all those that do not refer to real behavior. This can be illustrated with reference to Table 2, which shows the distribution of the importance of religion in 1975 and 2005. In 1975, the specific measured presence of those who declared a strong interest in religion was 77.6 percent, a figure that fell to 59.2 in 2005, registering an absolute drop of 18.4 percentage points and a relative drop of almost 25 percent. If we cannot assign the same meaning to the same answer — and thereby assume that there is some correspondence over time between what is said and what is actually done —, the trend analysis resulting from the use of this variable will be biased.

Given the above, the trend highlighted by religious affiliation will be some way behind the tendency recorded by measured presence. Even after people have stopped actively attending on a regular basis, they can still attend religious services on special occasions and even associate themselves with a religious group, although they are only affiliates in a nominal sense (Voas 2009: 162). Stable changes can only be measured when a religious group of affiliation is definitively abandoned. Nevertheless, the process of secularization has already produced variations that will not be detected.

If we analyze the individual denominations instead of general religious practice, we will see that the aforementioned problems tend to be heightened. For a long time (after 1930), the Netherlands was a segmented or pillarized society, meaning, for example, that Catholics married other Catholics, sent their children to a Catholic school, got Catholic medical attendance, voted for a Catholic political party and so on (Dekker and Ester 1996). Although the phenomenon is now of less importance, it has become more widespread among Catholics, who are more closely knit and committed to developing

this way of life than Protestants (Knippenberg 1998). The issue cannot be explored any further here, but we feel it likely that statements about belonging to a given denomination can also be influenced by factors that are largely unrelated to personal commitment in the religious sphere. For example, there was an identical relative drop of 36 percent in the number of Catholic and Protestant religious affiliates between 1975 and 2005 (Table 4). In terms of measured presence, the figure for Catholics fell from 10.6 percent in 1975 to 2.5 percent in 2005, a much higher relative drop of 76 percent. Conversely, Protestants do not suffer from this problem; there is a drop of only 30 percent (Table 3). Therefore, with regard to religious affiliation both religions were apparently affected by the process of secularization to the same extent. By contrast, in terms of measured presence Catholicism suffered considerably more than Protestantism. However, in many cases this is one of the few long-term variables available. This is partly because it is collected by census in some countries; in the Netherlands, for example, it was first recorded in this way in 1809 (Knippenberg 1998).

To sum up, studies that attempt to identify the start and causes of the process of secularization need to use these data, but with the necessary caution. As we have seen, both affiliation and measured presence can reveal the evolution of religious behavior over time¹². However, this trend tends to deviate significantly from the trend recorded by measured presence. Therefore, although this indicator is useful from a historical point of view and when it is used without differentiating between denominations, it becomes less important in medium and short-term analyses and if presence indicators are available.

Two indicators that are imprecise in different ways: calculated presence and cumulative rate

We will start by discussing calculated presence and then move on to the cumulative rate. As we have seen, calculated presence provides a good approximation of medium-term variations, but offers significantly higher values than those estimated by measured presence. The causes of these overestimates stem from two main factors. The first of these is the self-selection of the sample (Brennan and London 2001; Ellison 1992; Morgan 1983; Woodberry 1998), an aspect that also affects measured presence (see above). The second factor is the imprecise nature of the measurement tool. Some of the typical unavoidable problems faced by questionnaire-based surveys are social desirability (Smith 1998) and answering in terms of intentions rather than real behavior (Chaves 2010).

Besides the erroneous assessment of the actual scale of the religious phenomenon, calculated presence presents two other practical difficulties: inconstant overestimates over time and notable variations in bias for different religious denominations (Table 5).

[Table 5, here]

We will start with the first point. Although in the medium term the trends identified with the use of diaries give very similar results to the trends identified using questionnaires — respectively -49 and -52 percent from 1975 to 2005, see Tables 3 and 5 —, in the short term the irregular bias can lead researchers to make erroneous statements. For instance, the worst combination of overestimates identified in consecutive surveys (see the last row in Table 5) changes from +39 percent in 2000 ($P_m = 12.2$ percent with $P_c = 16.9$ and $I_c = 139$) to +23 percent in 2005 ($I_c = 123$). Therefore, while in the medium term high levels of bias do not necessarily alter the basic interpretation of data, in the short term differences of more than 10 percent could lead to misleading

considerations if the process of secularization were less deep-rooted or had a discontinuous trend.

The situation worsens when different denominations are compared. Nevertheless, even in this case with significant differences in the level of bias, the reading of the resulting medium-term trends is almost equivalent. For example, the relative figures of measured presence between 1975 and 2005 range from -76 percent for Catholics to -30 for Protestants, values that are not dramatically different from those obtained with calculated presence — respectively -74 and -42 percent (see Tables 3 and 5). The general conclusion is that secularization affected Catholics more than Protestants in the thirty-year period analyzed.

However, we feel that in-depth data readings may be problematic or even misleading, as the short-term levels of bias verge on the erratic. For example, the worst combination of overestimates identified in consecutive surveys changes for Catholics from a minimum of +49 percent in 1990 — see the I_c values in Table 5 — to a maximum of +77 percent in 1995, while for Protestants it ranges between +39 in 2000 and +19 in 2005. When there are notable differences in changes between denominations, as in this case, calculated presence can be used — with the necessary precautions — to make medium-term interpretations acceptable, while for the short term the above considerations apply even more.

We will now discuss the cumulative rate. This indicator cannot be directly compared to presence, as it only includes those who attend services with a selected minimum intensity. However, relative comparisons can be made in a similar way to those for religious affiliation. Therefore, in a diachronic analysis, a relative loss of presence at worship should correspond to an approximately similar drop in the cumulative rate. From

1975 to 2005, the proportion of those attending religious services at least once a month dropped from 36.2 to 19.8 percent, with a relative drop of 45 percent (see Table 6). As we can see, this does not differ greatly from the value derived from measured presence (-49 percent, see Table 3). This result may be arbitrary, as it is connected to an assumption that we feel is frequently invalid.

[Table 6, here]

When using cumulative rates in diachronic comparisons, it is assumed that *there is equal variation in the changes between the different levels selected*. In other words, the relative variation obtained from $F_{t_2 t_1}(X) = (F_{t_2}(X) - F_{t_1}(X))/F_{t_1}(X), \forall X$, in which t_1 and t_2 are respectively generic times 1 and 2, does not vary when X changes. If this were the case, however, we would find approximately similar column values in Table 6¹³. This does not happen here, as the cumulative rate varies significantly according to the chosen criterion. For example, the relative difference between 1975 and 2005 changes from -59 percent among those who stated that they attend services every week to -45 percent among those who said they attend once a month. There is thus a greater effect among those who said they attend services more frequently.

It could be claimed that the equal variation in the changes between the different levels is an unnecessary assumption, as the use of cumulative rates is simply an approximate way to separate those that are still in contact with their given denomination. Indeed, monthly attendance of services is typically used as a selective criterion, while weekly attendance is more rarely chosen. However, these cases fail to consider that there may be uneven forms of ‘slippage’ between the different attendance frequencies that make up the cumulative rate. For example, there might be a significant slip between the categories

‘every week or more frequently’ and ‘at least once a month or more’. In this case, there may be a notable variation in presence without any repercussions on the cumulative rate (see Simulation 1 in Appendix A). Conversely, presence may decrease to a limited degree even if there are sustained variations in $F_{t_2t_1}(X)$ (see Simulation 2). Therefore, the cumulative rate may add another form of distortion regarding the detection of changes revealed by measured presence.

We can use the comparison between Catholics and Protestants to illustrate this point. Our data show (Table 7) that the drop in religious practice by Catholics was most marked among the most assiduous churchgoers. From 1975 to 2005, the relative variation in $F_{t_2t_1}(X)$ was -87 percent among those who said that they attend services at least once a week, while there was a much more limited drop among those who go to church once every 2-4 weeks (-29 percent). As we can infer from the table, the former also make the biggest contribution to the definition of measured presence, as their levels of specific presence are very high and diminish slightly over time¹⁴. The overall result of these variations is a reduction in P_m of -76 percent (Table 3), which is significantly higher than the figure for the cumulative rate (-66 percent, Table 6).

The situation for Protestants is quite different, as the drop in religious practice was less uneven (Table 7). From 1975 to 2005, the relative variation in $F_{t_2t_1}(X)$ was -44 percent among those who stated that they attend services at least once a week, while there was a fall of only -21 percent among those who go to church once every 2-4 weeks. Furthermore, in contrast to the previous case, there is an increase in the specific measured presence of those who said they attended services once a month or more¹⁵. The overall result is that the drop in measured presence (-30 percent) is lower than the figure recorded using the cumulative rate (-36 percent).

In other words, compared to calculated presence the cumulative rate introduces a further element of distortion that sometimes magnifies the extent of the error, such as in the case of Catholics, where the respective variations in P_m , P_c and $F_t(X)$ are -76, -74 and -66 percent (respectively Tables 3, 5 and 6), and sometimes reduces it, such as in the case of Protestants, where the respective differences are -30, -42 and -36 percent¹⁶.

To sum up, this is another instance of researchers making virtue of necessity. In many cases, the frequency of attendance at religious services is the only indicator available, as many countries do not include religious affiliation in their censuses. Furthermore, the variable is often available for a relatively long time span; the first survey in the Netherlands was at the beginning of the 1960s¹⁷. Therefore, calculated presence is a valid indicator in medium-term studies, especially when denominations are not specified, but is unsuitable for short-term analysis. Finally, the use of cumulative rate is, in our opinion, not recommended, as the assumption of equal variation in all levels of frequency of attendance over time and between different denominations may be wrong. Nevertheless, we should add that in our case, the trend identified by the cumulative rate is not systematically more distorted than the one derived from calculated presence. It is therefore ultimately up to the researcher to assess which one to use.

Summary and Conclusions

The sources available in the field of religious behavior are subject to intrinsic limits that often leave little room for choice. Researchers need to adapt their work to indicators that have already been measured, whether their studies focus on long, medium or short-term trends.

The first indicator considered was religious affiliation. As we have seen, this is an extremely volatile and imprecise measure. Nevertheless, it is useful in long-term studies,

which typically aim to identify the triggering causes and starting date of the process of secularization. In this instance, the ‘weakness’ of the measure is of less importance because the changes under analysis are often significant. Instead, in medium and short-term studies, where changes are often less evident or minimal, the indicator needs to be used with the utmost caution. Finally, the situation worsens if we analyze various denominations.

The recent availability of surveys that use a questionnaire featuring a frequency item favors the use of calculated presence for medium-term analysis, as it is much more precise than religious affiliation. Here too though, inferences could become problematic when analysis is conducted by denomination. Studying the cumulative rate allowed us to highlight that, compared to calculated presence, this indicator introduces a further factor of bias which is not necessarily cumulative. We have seen that estimates are sometimes better and sometimes worse than those provided by calculated presence. It will thus be up to the researcher to assess whether or not to use this indicator.

Calculated presence and cumulative ratio are therefore valid measures in medium-term studies of religious behavior, which typically attempt to discover the features of the relevant trend and establish whether it is monotonic. By contrast, short-term temporal analysis is not recommended as it is affected by erratic variations in the overestimate levels and the irregular bias can lead researchers to make erroneous statements.

Finally, the most recent availability of Time Use Surveys makes it possible to study religious behavior much more precisely. Therefore, measured presence is the most appropriate tool when there is available data and the focus is on a short time span, typically in an attempt to reveal the current state of the process and establish whether it is still increasing, has stopped or is decreasing.

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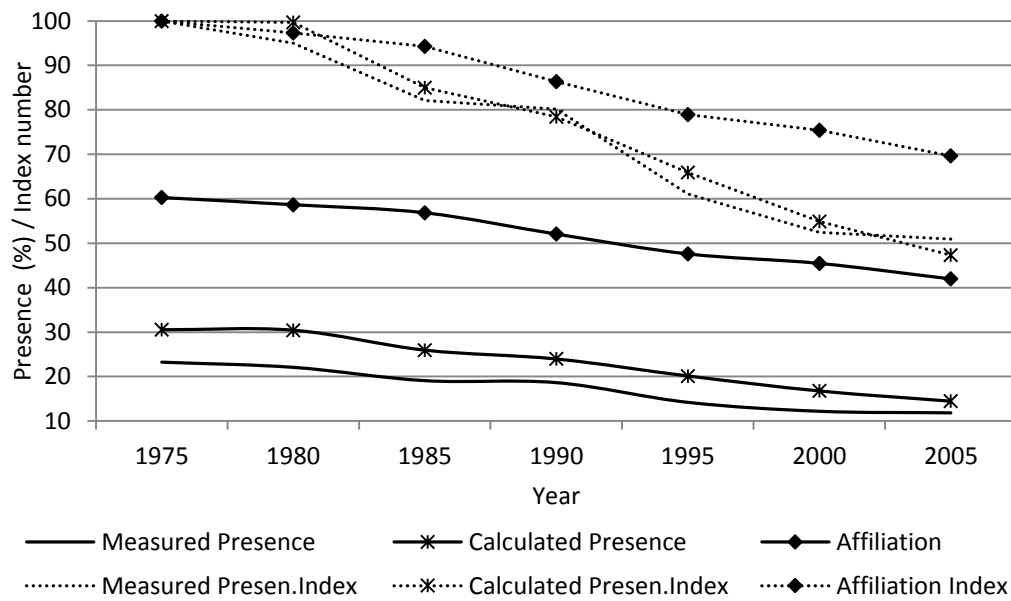
Notes

- ¹ We will only cite authors that have discussed the evolution of religiosity in the Netherlands. As the trend measured here clearly shows the process of the loss of importance of religion, we will discuss secularization. However, our assessments of the indicators will be general and could also be used to refer to processes of desecularization.
- ² Activity code = 650, place code \neq 1.
- ³ More information about the LISS panel can be found at www.lissdata.nl.
- ⁴ Two items were used for this study: ‘Do you consider yourself a member of a certain religion or church community?’ — with two answer categories ‘yes’ and ‘no’ — and ‘Aside from special occasions such as weddings and funerals, how often do you attend religious gatherings nowadays?’.
- ⁵ This familiar conversion procedure has been used by a number of other researchers (see Gershuny 2003: 267-68; Hout and Greeley 1998; Presser and Stinson 1998; Woodberry 1998).
- ⁶ Like the previous formulae, this one refers to proportions. Instead, the data in the tables are given as percentages.
- ⁷ This is a familiar situation, as the trend highlighted by affiliation is frequently extremely similar to the trend determined using a measure of religious practice (Voas 2009; Knippenberg 2015; Voas and Chaves 2016). In other words, ‘Rather than view these as different, [the distinct indicators] [...] indicate different aspects of the same latent variable’ (Grant 2008: 411).
- ⁸ The following groupings were used to divide religious affiliation into 4 categories: *Never*; *Catholic* (Roman Catholic); *Protestant* (PKN, Dutch Reformed, Calvinist/ReReformed) and *Other*.
- ⁹ These subjects not only consider the religious aspect to be of little importance, but also highlight the greatly reduced levels of presence. As Table 2 shows, the relative values of specific measured presence are 8.9 percent (not very strongly affiliated) and 1.9 percent (hardly affiliated) in 1975 and 6.2/2.5 percent in 2005.
- ¹⁰ In our case, there was two-stage questioning with a filter item: ‘Do you regard yourself as belonging to a church community, religion or ideological grouping?’ with two answer categories: ‘yes’ and ‘no’. If yes is selected, one or more items follow. In our specific case, the filter was applied to three items: ‘How strongly do you feel involved with Church or religious life?’, ‘To which Church community or religious movement would you class yourself as belonging?’ and the item about frequency of attendance at religious services mentioned in the text. The answer options are shown in the tables or quoted in the text.
- ¹¹ The fact that changes in the formulation of the item give rise to notable variations in the level of religious affiliation has also been demonstrated in other contexts. For example, the Gallup survey, which does not explicitly suggest ‘no religion’ to respondents as a possible answer, reports a significantly higher percentage of ‘nones’ than other surveys (Hout and Fischer 2002).
- ¹² There is no consideration here of the possibility of religious adherence overlapping either partially or completely with the different ethnic groups in the context under analysis. In this case, the outlined trend may be subject to further bias, which must be considered in the analysis (Voas and Bruce 2004).
- ¹³ It is easy to demonstrate that if $f_{t_2t_1}(x) = k \forall x$, in which (x) is the specific contribution added to the cumulative rate, then $F_{t_2t_1}(X) = k$. This is an attractive property: $P_{t_2t_1} = F_{t_2t_1} = k$, in which $P_{t_2t_1}$ indicates the relative variation in presence at time t2 compared to t1.
- ¹⁴ For example, the figure for those who said that they attend services at least once a week fell from 72.9 percent in 1975 to 68.5 in 2005.
- ¹⁵ For example, the figure for those who said that they attend services at least once a week increased from 77.0 percent in 1975 to 83.6 in 2005.

¹⁶ It follows that the 'poverty' of information in the diary is entirely relative, as the information about frequency in the short term is not very reliable.

¹⁷ The first survey was conducted in 1960, but the first study was published in 1966 and was entitled "God in Nederland 1966". For a more comprehensive discussion of the less recent sources, see Te Grotenhuis, Manfred, and Peer Scheepers (2001).

Fig.1 Yearly distribution of affiliation, measured and calculated presence and the relative index numbers



Data source: *TBO 1975-2005*. Year 1975 Index=100.

Table 1: Stability/instability of religious affiliation by age in the period 2008-2014
(percentage). Year of reference: 2008

	18-29	30-44	45-59	60-74	Total
Always no	61.8	53.9	48.7	37.5	48.3
Always yes	17.7	24.5	30.8	43.3	31.3
Change (<i>of which</i>)	20.5	21.6	20.5	19.1	20.4
Once	7.6	6.3	6.4	6.5	6.5
More than once	12.9	15.3	14.1	12.6	13.9
Total	100.0	100.0	100.0	100.0	100.0
(N)	(249)	(621)	(963)	(674)	(2507)

Data source: *LISS 2008–2014*

Table 2: Importance of religion by specific measured presence and year (percentage)

	1975			2005		
	<i>all sample</i>	<i>affiliated</i>	<i>specific P_m</i>	<i>all sample</i>	<i>affiliated</i>	<i>specific P_m</i>
<i>Affiliated (of which)</i>	60.3			42.0		
Strongly	15.3	25.5	77.6	10.8	25.8	59.2
Fairly	20.6	34.1	42.5	15.2	36.1	27.0
Not very strongly	16.9	28.0	8.9	13.2	31.5	6.2
Hardly	7.5	12.4	1.9	2.8	6.6	2.5
<i>Not affiliated</i>	39.7		2.4	58.0		0.8
Total	100.0	100.0	23.2	100.0	100.0	11.8
(N)	(1128)			(1821)		

Data source: *TBO 1975 and 2005*

Table 3: Measured presence by religious affiliation and year (percentage)

	1975	1980	1985	1990	1995	2000	2005	Relative difference % (‘75-‘05)
Not affiliated	1.0	1.2	0.5	0.5	0.5	0.4	0.4	
Affiliated (<i>of which</i>)	22.2	20.9	18.6	18.1	13.7	11.8	11.4	-49
Catholic	10.6	9.9	7.3	6.9	4.7	3.7	2.5	-76
Protestant	9.5	9.1	9.4	9.1	7.4	6.3	6.7	-30
Other	2.3	2.0	1.9	2.1	1.6	1.9	2.2	-2
Total	23.2	22.1	19.1	18.6	14.2	12.2	11.8	-49
(N)	(1128)	(2345)	(2893)	(2830)	(2902)	(1613)	(1821)	

Data source: *TBO 1975-2005*

Table 4: Religious affiliation by denomination and year (percentage)

	1975	1980	1985	1990	1995	2000	2005	Relative difference % (75-'05)
Not affiliated	39.7	41.3	43.2	47.9	52.4	54.5	58.0	+46
Affiliated (<i>of which</i>)	60.3	58.7	56.8	52.1	47.6	45.5	42.0	-30
Catholic	30.4	31.9	29.8	26.0	23.9	24.1	19.4	-36
Protestant	25.9	23.3	23.8	22.2	19.8	17.0	16.5	-36
Other	4.0	3.5	3.2	3.8	3.9	4.4	6.1	+50
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
(N)	(1128)	(2345)	(2893)	(2830)	(2902)	(1613)	(1821)	

Data source: *TBO 1975-2005*

Table 5: Calculated presence by religious affiliation and year (percentage) and I_c values*

	1975	1980	1985	1990	1995	2000	2005	Relative difference % (‘75-‘05)
Calculated presence (P_c)								
Catholic	15.9	16.7	12.3	10.3	8.3	6.6	4.1	-74
Protestant	13.7	13.8	12.7	11.8	10.5	8.7	8.0	-42
Other	2.5	2.4	2.2	2.8	2.4	2.6	3.2	+25
Total	30.6	30.6	26.1	24.1	20.3	16.9	14.6	-52
(N)	(1128)	(2345)	(2893)	(2830)	(2902)	(1613)	(1821)	
I_c								
Catholic	150	169	168	149	177	179	164	
Protestant	144	152	135	129	142	139	119	
Other	113	121	119	133	149	142	143	
Total	132	138	137	129	143	139	123	

* The corresponding values of P_m are shown in Table 3.

Data source: TBO 1975-2005.

Table 6: Relative difference ($F_{t2t1}(X)$) of frequencies of attendance at religious services in 2005 compared to 1975, by different levels of cumulative rate and denomination (percentage)

	<i>Relative difference ($F_{t2t1}(X)$)</i>			
	Cath.	Prot.	Other	Tot.
Once a week or more frequently	-87	-43	14	-59
Every 2-3 weeks or more freq.	-77	-41	47	-52
Once a month or more freq.	-66	-36	57	-45
Every 2-3 months or more freq.	-60	-37	39	-43
Every 4-6 months or more freq.	-55	-36	41	-40
Every 7-12 months or more freq.	-47	-37	53	-36
Less than once a year or more freq.	-38	-31	54	-29

Data source: *TBO 1975 and 2005*

Table 7: Frequency of attendance over the whole sample, relative variation and specific P_m , by religious affiliation and year (percentage)

	1975	2005	Relative variation	1975	2005
				<i>specific P_m</i>	
<i>Catholic</i>					
once a week or more	12.2	1.6	-87	72.9	68.5
once every 2-4 weeks	6.8	4.8	-29	22.9	20.8
less than once a month	8.4	10.3	22	3.0	3.9
never	3.0	2.7	-11	2.6	0.0
Total	30.4	19.4	-36		
(N)	(337)	(346)			
<i>Protestant</i>					
once a week or more	10.9	6.2	-44	77.0	83.6
once every 2-4 weeks	4.4	3.4	-21	29.6	33.1
less than once a month	4.7	4.1	-14	0.0	6.5
never	5.8	2.8	-51	2.6	3.9
Total	25.9	16.5	-36		
(N)	(261)	(293)			

Data source: *TBO 1975 and 2005*

Note, the variable frequency of attendance at church has N=28 missing in 1975. To simplify the reading, the column percentage values were resized to those in Table 5.

Appendix A

Specific P_m at time T1, Simulation 1 and Simulation 2, by frequency of attendance (percentage)

	Specific P_m		T1		Simulation 1		Simulation 2	
	(a)	(*b)	(a)	(b)	(a)	(b)	(a)	(b)
<i>Frequency of attendance</i>								
once a week or more	72.9	12.2	8.9	8.2	6.0	12.2	8.9	
once every 2-4 weeks	22.9	6.8	1.5	10.8	2.5	2.8	0.6	
less than once a month	3.0	8.4	0.3	8.4	0.3	12.4	0.4	
Never	2.6	3.0	0.1	3.0	0.1	3.0	0.1	
Total		30.4	10.8	30.4	8.8	30.4	10.0	
Cumulative rate variation compared to T1 (once a month or more)				0.0		-21		
Variation in P_m compared to T1					-18		-7	

Note. The values of specific P_m are not invented – they refer to Catholics in 1975, see Tab. 8.

(a) Rate of attendance calculated over the whole sample.

(b) Contribution to P_m by category of frequency of attendance – multiply (a) by the corresponding value of specific P_m and divide by a hundred to obtain the value of (b), see *Catholic* (1975) in Tab. 4. The small discrepancy (total=10.6) with the value in column (*b) is due to the missing data (N=28).

Simulation 1: high relative variation in P_m without variation in cumulative rate;

Simulation 2: greater variation in cumulative rate than P_m .