

# Influence of School Closure on COVID-19 Contaminations in Ireland and Repercussions across Age Groups

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## Abstract

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## Introduction

Since the onset of Covid-19, contradicting messages are circulating about the spread of the virus in schools. Sometimes presented as a safe environment (Falk et al., 2021; Walger et al., 2020), at other times designed as an aggravating factor of the pandemic (Lopez et al., 2020; Meuris et al., 2021), child care facilities and schools have been closed multiple times in most countries to protect the public health. However, the efficacy of school closure is still unknown and little is known about how Covid-19 Cases spread across age cohort and especially from the younger cohort being at school to older cohorts including parents, grand parents and relatives. Some evidence show that school is an influential environment where the virus is likely to spread. Once contaminated at school, a common spread believe is that the children and teenagers will then contaminate their parents. Therefore, among the political actions to stop the spread of Covid-19, the closure of primary and secondary schools was widely adopted worldwide. This research aims to investigate 1) the effect of school closure on the evolution of Covid-19 cases and 2) the temporal relationship between the rise of cases in children and teenagers with the rise of cases of older age group.

### *Influence of School Closure*

One of the strongest assumption of government actions is that by reducing social contact will reduce the spread of the virus. Therefore, it is legitimate to believe that by closing schools, a reduction of the contaminations would be observed in the younger age groups. However, the efficiency of school closure on

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the reduction of Covid-19 cases is still questioned. While some research have observed that school closures contribute to limit or to reduce the growth rate of confirmed cases after implementation (Stage et al., 2021; Sugishita, 2020), other did not observe a change in the evolution of Covid-19 cases (Chang et al., 2020; Iwata et al., 2020). For instance, a controlled comparison between similar localities in Japan with schools closed and school open did not revealed any evidence that school closures reduced the spread of Covid-19 (Fukumoto et al., 2021). If the school closure had a real impact on the evolution of confirmed Covid-19 cases, it should be possible to observe a decrease or a least an inflection in the trend of its evolution among younger age groups.

### *Causal Relationship Between Age Groups*

A second implicit believe regarding the effect of school closure on the spread of Covid-19 is that school not only has an effect on to the spread of the virus in children and teenagers but also has a knock-on effect on the spread of the virus in older age groups also called Secondary Attack Rate (SAR). The contaminated children and teenagers would bring the virus back at home and, then, they will contaminate their parents and relatives. Despite being reported in several clinical and epidemiological studies (Siebach et al., 2021; Zhen-Dong et al., 2020), multiple research have shown that the SAR from children to household members was, in fact, lower than expected (Heavey et al., 2020; Hoek et al., 2020; Kim et al., 2021; Ludvigsson, 2020). However, the SAR of children and teenagers to the household member is likely to be age-dependent, with difference between infants, primary and secondary school children, and college students (Gras-Le Guen et al., 2021). A research investigating the contamination in the household network not only revealed an exceptional high rate of secondary contamination but also that these contamination happened when the school were closed (Soriano-Arandes et al., 2021).

## **Method**

Contrary to Granger Causality, Transfer Entropy is robust to non-stationary time series (Silini and Masoller, 2021). The Transfer Entropy analysis of younger age groups daily changes in Covid-19 cases on older age groups is done using the R package RTransferEntropy (Behrendt et al., 2019).

## **Results**

## **Discussion**

Knowledge about the transmission of the virus significantly improved with the amount of studies performed, especially in the case of how the virus behaves with children. From the early analyses showing that the virus was instantness in children (Li et al., 2020), the results has changed to more nuanced position which states that the spread of the virus in children is moderate.

## Conclusion

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