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Dear Colleagues:

Below, we offer comments on your recent report, *Investigation of Reported Cancer among Soccer Players in Washington State* (January 2017).

In the study, the Washington State Department of Health (DOH) set out to determine whether the number of cancer diagnoses among the soccer players reported was higher than would be expected if rates of cancer among these soccer players were similar to rates among all Washington residents of the same ages.

However, the study was poorly designed to accomplish this goal, and the conclusions in the report are not supported by the study's own data.

The Executive Summary and the Conclusions and the Recommendations of the study contain statements that are not based on the information presented in the report. These statements should be revised or removed in order to avoid confusion among those using the report as a resource for decision-making.

Key concerns include the following.

**1. The report uses an informal, incomplete list of cancer cases.** The report uses information from a list of soccer players with cancer compiled by Amy Griffin, a University of Washington soccer coach. This list is composed of individuals who have been diagnosed with cancer, have played on synthetic turf fields, and had sufficient information to contact Coach Griffin directly about their cancers. This list is a valuable source of information about sentinel cases of disease, which can serve as a "red flag" indicating a possible need for more research, but it cannot be assumed to represent all cases of cancer among soccer players.

**2. The report's presents an invalid and misleading calculation of an "observed/expected" ratio.** Comparing *observed* to *expected* cases of disease is a key tool for epidemiologists to identify situations in which disease rates may be elevated. An observed to expected (O/E) ratio above 1 indicates there may be increased risk associated with a given exposure, while a ratio

below 1 indicates that the exposure may be protective from disease. A ratio of approximately 1 suggests the absence of any health effect.

An O/E ratio is only meaningful if one has made a systematic effort to identify all the individuals with the disease. It is not meaningful if such an effort has not been made.

Using a variety of assumptions, the Department estimates an expected number of 1,384 cancer cases among individuals who were 6 to 24 years old in the period 2002-2015 and may ever have played soccer. The report then contrasts that expected number with 28 cases from Amy Griffin's list. Dividing 28 by 1,384, the report concludes that this portion of Coach Griffin's list accounts for just 2% of the expected number of cancers, based on their assumptions.

This finding strongly supports the common-sense conclusion that Coach Griffin's list does not represent all the cancer victims in the specified age range who have ever played soccer. It does *not* indicate an absence of a health effect from exposure to artificial turf fields.

The Department of Health is not justified in stating that "This investigation **did not find** increased cancer among the soccer players reported to the project team compared to what would be expected based on rates of cancer among Washington residents of the same ages." ("Conclusions and Recommendations," p. 42) This language represents false reassurance based on faulty logic and methodology. Rather, the Department of Health should have stated: "This investigation **was not able to assess** whether there was increased cancer among the soccer players reported to the project team compared to what would be expected based on rates of cancer among Washington residents of the same ages."

In summary, the effort to calculate expected cases was not accompanied by a comparable effort to identify observed cases. The case list from the coach was unequivocally incomplete and should not have been used in the calculation of O/E ratios. Based on fallacious calculations, no valid conclusions can be drawn.

**3. The report considers an inappropriately wide range of ages.** The average age of the soccer players on Coach Griffin's national list is 20-21 years of age. This age grouping could be indicative of age at which disease is likely to develop, or could result largely from the fact that Coach Griffin works primarily with college-age individuals. In either case, it would be appropriate to compare these figures with expected rates in a comparable age range. The Department developed an expected number of cancers for Washington residents ages 6 to 24, a much broader age range. This approach makes it more difficult to detect any possible effect.

**4. The report does not consider length of exposure, latency period, or other important factors.** The report does not distinguish between people who have had a long period of exposure and those who have had only a brief exposure. The report also does not take into

consideration the long latency period of cancer. Neither of these considerations can realistically be built into the current report, due to the incompleteness of the data, but these considerations should be central to the design of any future study. It is also important to note the preponderance of goalkeepers identified in Coach Griffin's list. The DOH makes unrealistic assumptions about the total number of goalkeepers in the population, thus discarding a potentially important risk factor using faulty logic.

**5. The report makes a number of misleading and confusing statements about its scope.** The report includes many caveats expressing the limits of the research undertaken by the Department. However, unfortunately it also includes a number of statements that are unsupported by their data. These statements create the false impression that the Department has assessed the relationship between artificial turf exposure and cancer risk. The report should be revised to eliminate these misleading statements, including the statement in the Executive Summary that "This finding does not suggest that soccer players, select and premier soccer players, or goalkeepers in Washington are at increased risk for cancer compared to the general population" (p.4), and the statement that "The Washington State Department of Health recommends that people who enjoy soccer continue to play irrespective of the type of field surface." (p.5) These statements are irresponsible given that the Department did not assess the relationship between artificial turf exposure and cancer risk.

### **Recommendations for future research**

To investigate the relationship between artificial turf exposure and cancer risk in Washington State, we recommend designing a valid population-based case-control study. Such a study would use the state cancer registry to identify cases of leukemia and lymphoma diagnosed in individuals aged 15-29 during the time period 2002-2015 or later. Controls would be identified from the school districts or towns of residence of the cases, and interviews would be conducted to gather information about artificial turf exposure as well as other risk factors.

We recommend a case-control study with cases aged 15-29 because that is a range of ages at diagnosis in which artificial turf exposure could reasonably be expected to play a causal role, accounting for disease latency. Including children as young as age 6 in the "case definition" would potentially include cases who could not realistically have been exposed on a soccer field sufficiently prior to their diagnosis to provide meaningful information on the exposure-disease relationship. In occupational studies, researchers often use a "lag period" of up to ten years to take into account a latency window for cancer.

A study of this kind would be time consuming and potentially costly to undertake. However, it would be scientifically valid. This approach was used, for example, to investigate the childhood

leukemia cluster in Woburn, Massachusetts and the excess leukemia around the Pilgrim nuclear plant in Southeastern Massachusetts.

We understand that the Department of Health may not have had the resources to undertake a study of this kind. In the absence of such a study, however, the conclusions drawn by the Department in its January 2017 report were inappropriate and irresponsible.

### **Summary**

The Washington State Department of Health did not have sufficient data to make any statement regarding the safety of exposure to artificial turf fields containing infill made from recycled tires. The statements in the Executive Summary and in the conclusions are misleading and are likely to be used out of context by decision-makers.

Respectfully,

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