and urinary benzene (U-Benz) to detect low level occupational and environmental exposure to benzene.

Methods We monitored airborne benzene by personal air sampling, and U-Benz, s-PMA, t,t-MA and cotinine (U-Cotinine) in spot urine samples, collected at 8 am and 8 pm, in 32 oil refinery workers and 65 subjects, randomly selected among the general population of urban and suburban Cagliari, Italy.

Results The median concentration of airborne benzene was 25.2 g/m³ in oil refinery workers, and 8.5 g/m³ in the general population subgroup. U-Benz in morning and evening samples was significantly more elevated among oil refinery workers than the general population subgroup ($p = 0.012$, and $p = 7.4 \times 10^{-7}$, respectively) and among current smokers compared to non-smokers ($p = 5.2 \times 10^{-8}$, and $p = 5.2 \times 10^{-5}$ respectively). Benzene biomarkers and their readings in the two sampling phases were well correlated to each other. The Spearman's correlation coefficient with airborne benzene was significant for U-Benz in the evening sample, but not for t,t-MA and s-PMA in either sampling. Morning U-Cotinine excretion showed a good correlation with U-Benz in the morning and in the evening sampling ($p < 0.001$), and with s-PMA in the evening sample ($p < 0.001$), but not with t,t-MA in either samplings. t,t-MA in the evening sample was the only biomarker showing a moderate inverse correlation with BMI ($p < 0.05$). The multiple regression analysis adjusting by BMI and number of cigarettes smoked during the day confirmed the results of the univariate analysis.

Discussion Our results suggest that unmetabolised U-Benz would allow a more reliable biomonitoring of low-level exposure to benzene than s-PMA and t,t-MA.

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Objectives Excess risk of lympho-hematopoietic malignancies has been documented in farmers. Although numerous studies have investigated associations of various pesticides with lympho-hematopoietic malignancies, results have been inconsistent. A crop/livestock-exposure matrix for estimating exposures to pesticides is being developed for a pooled analysis of lympho-hematopoietic malignancies in farmers.

Methods Data arise from the United States Agricultural Health Study (AHS), the French Agriculture and Cancer Study (AGRICAN), and the Cancer in the Norwegian Agricultural Population Study. When study data are unavailable, historical information on region and crop/livestock specific pesticide use are being gathered from agricultural records, experts, and the French PESTIMAT matrix. Selection of matrix axes is based on information availability and importance in predicting pesticide exposures; of crop/livestock categories is based on major commodities in each

country and common production across or frequent production within the cohorts; and of chemical groups is based on frequency of use and a priori expectations of associations with lympho-hematopoietic malignancies.

Results The cohorts contain varying levels of exposure information. AHS contains information on ever lifetime chemical use for 52,394 private applicators. AGRICAN contains data on crops/livestock ever produced in the lifetime of 182,132 farmers. For each 10-year agricultural census from 1969–1989, the Norwegian cohort contains data on crops/livestock farmed by 248,000 farmers and spouses. Matrix axes will be defined by time period, crop/livestock produced and pesticide chemical group. Matrix cells will be filled with pesticide use information by chemical group and, if possible, chemical substance. Crop/livestock groups will include major categories such as corn, grains, potatoes, soybeans, tobacco, vineyards, poultry, beef cattle, dairy cattle, swine and sheep/goats.

Conclusions This work demonstrates the development of a pesticide exposure matrix using pooled data from multiple countries, which will be used for the largest evaluation of pesticides and lympho-hematopoietic malignancies to date.

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Background Little is known about the potential for overexposure to respirable quartz in farming, in most parts of the world.

Objectives To measure respirable dust and quartz exposure of tractor operators on two medium-sized dry climate farms.

Methods This is a descriptive cross-sectional study design of dust exposure of four tractor operators. Farms were selected by convenience sampling. The MDHS 14/3 and FTIR MDHS 101 HSE methods were used to measure dust and to analyse the mass of quartz in dust, respectively.

Results Seventy respirable dust measurements were done. Respirable dust and quartz ranged from 0.01 to 2.88mg/m³ and 0.001 to 0.30mg/m³. All operators had at least one respirable quartz exposure above 0.1 mg/m³. Only 17% of respirable quartz concentrations were lower than the ACGIH TLV of 0.025 mg/m³.

Conclusion The potential for over-exposure to respirable quartz was demonstrated. There was a great deal of variability in these farms which has implications for sampling strategies for dust in farming.

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Objective Many of the demographic and labour market characteristics of workers that are associated with the risk of work-