A Mortality Survey at the Anniston Plant 1980-1994

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Background

There is increasing interest on the part of workers and plant management in the occurrence of illnesses and injuries among our employees. Further, residents of communities around our plants are sometimes concerned that our operations may be impacting their health. To address these concerns, we are producing a mortality surveillance report at all U.S. Solutia locations[1].

This report concerns employees working at the Anniston plant from 1980 to 1994 and updates an earlier report which examined employees working from 1980 to 1989[2]. These reports provide our workers and communities around that plant with health information to help evaluate the safety of our operations.

Methods

Solutia has maintained a computerized occupational health data system (MARS) which contains demographic information on all employees working at Anniston from 1980 to 1994. According to MARS, 386 employees have worked at the plant some time during 1980 to 1994.

Vital status information was obtained on 98% (377 of the 386) of the workers through Solutia payroll and pension files, and the National Death Index. Twenty-one workers were deceased (5%) over the study period. Death certificates were obtained for all decedents and coded by two trained nosologists according to the Eighth Revision of the International Classification of Disease[3]. Differences in coding between the nosologists were reconciled through discussion.

We calculated standardized mortality ratios (SMRs) to compare worker mortality rates with rates for the U.S. population. The SMR is the ratio of death rates for Anniston employees to the U.S. population adjusted for differences in age, sex, race, and calendar year. An SMR of 1.0 indicates that the workers' death rate is equal to the U.S. death rate or that that the number of deaths occurring at the plant equals the number expected based on U.S. death rates. We calculated 95% confidence intervals using the Fisher exact method to assess the statistical variability of the SMR[4]

We used the Occupational Cohort Mortality Analysis Program (OCMAP) to conduct the SMR analysis[5]. Person year enumeration began at hire or 1/1/80 for those hired before that date and accumulated through the end of the study date for workers who are alive, until the last date of contact for those lost to follow-up, and until the date of death for deceased workers. We restricted the

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analysis to the most common causes of death (i.e., all external causes of death, all heart disease, total cancers, and cancers of the lung, colon, prostate [males only], and breast [females only]).

Results

There were 276 white males, 40 non-white males, 51 white females, and 14 non-white females in the study group. Table 1 shows the number of observed and expected deaths for these workers with the related SMRs and 95% confidence intervals for the total plant population. The 386 workers had mortality rates below expected levels (SMR=0.6, 95%CI=0.4-0.9). There were only 7 cancer deaths observed versus 10.4 expected. Four of the cancer deaths were prostate cancers producing an SMR of 1.1 (95%CI=0.3-2.8). There was one death from colon cancer (0.8 expected). There were no deaths from breast cancer (0.3 expected) or prostate cancer (0.5expected). Sever heart disease deaths occurred among Anniston workers versus 11.5 expected (SMR=0.6, 95%CI 0.2-1.3).

There were three accidental deaths among Anniston employees which were less then expected (SMR=0.7 95%CI=0.1-2.0). All of these deaths occurred among persons no longer working for Solutia.

Table 2 stratifies the data by duration of employment. There were three deaths among employees who worked less than 10 years at the plant (SMR=0.5, 95%CI=0.1-1.5). One cancer deaths occurred among these workers versus 1.2 expected. Among longer term employees the SMRs were similar to shorter term workers and generally lower than or at expected levels for the U.S. population. All four lung cancer deaths occurred among these long term workers (SMR=1.2, 95%CI=0.3-3.0). Mortality rates among long term workers for heart disease (SMR=0.6, 95%CI=0.2-1.2) were less than expected and accidents (SMR=1.2 95%CI=0.2-3.5) were at expected levels.

Although not presented, analyses examining the duration of time between hire date and death, sex, and race (white and non-white) only marginally changed the relative risk estimates.

Discussion

The finding of the current study are very similar to the earlier mortality surveillance report[2]. The current study indicates that workers employed from 1980 to 1994 have very low mortality rates compared to the U.S. population. This lower mortality is uniform across sexes, races, and subgroups classified by the duration of employment, and time since first employment. Part of the reason for this low mortality rate is probably due to the "healthy worker effect" as described by Checkoway et al.[6] The healthy worker

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effect refers to the low mortality rates experienced by workers because of initial selection of healthy persons into the workforce and to health and economic benefits that are part of employment.

However, the mortality deficit among Anniston's workers is larger than that typically seen in occupational mortality studies. This large deficit in mortality is probably the result relative short follow-up since workers were hired[7], a low prevalence of smoking and alcohol abuse, and no negative impact of plant operations on workers' mortality rates.

Long term workers (i.e., employees working 10 or more years for Solutia) had no cancer excesses and had cancer levels similar to short term workers. This finding suggests that the work place had no adverse health impact on workers.

There were no deaths resulting from a workplace injury at the Anniston plant during the study period. Of the three accidental deaths, two were suicides and one was an automobile accident. These accidental deaths were less than the number expected.

Further, the findings for the Anniston plant are similar to other mortality surveillance studies done within other companies[8-14]. SMRs for total mortality and all cancers in these studies are similar to SMRs for the Anniston plant. These findings suggest that the work place had no adverse health impact on workers.

Conclusions

This study focuses on recent mortality levels and does not necessarily reflect historical conditions at the plant. The favorable mortality experience of workers employed between 1980 and 1994 would suggest that major undiscovered hazards are unlikely. The data from this study should offer reassurance that employees working at the Anniston plant experienced no excess mortality from cancer, heart disease, or accidents.

The usefulness of the mortality surveillance program will increase as time passes and more data is accumulated. The next Solutia-wide mortality follow-up is scheduled for 2001 when the results covering the period 1980-99 become available.

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Table 1. Standardized mortality ratios (SMR), 95% confidence intervals (CI), observed and expected numbers of deaths for Anniston workers by cause of death.

Cause of Death (ICD Codes[1])	***Observed/Expected***	***SMR(95% CI)***
All causes of death (0-999)	**21/36.9**	**0.6(0.4-0.9)**
All cancer (140-209)	**7/10.4**	**0.7(0.3-1.4)**
Colon (153)	**1/0.8**	**1.2(0.0-6.8)**
Lung (162)	**4/3.7**	**1.1(0.3-2.8)**
Breast (174)	**0/0.3**	**0.0(0.0-12.6)**
Prostate (185)	**0/0.5**	**0.0(0.0-6.9)**
All heart disease (390-398, 400.1, 400.9, 404, 404, 410-414,420-429)	**7/11.5**	**0.6(0.2-1.3)**
All external causes of death(800-999)	**3/4.3**	**0.7(0.1-2.0)**

[1] A unique code is assigned to each distinct illness and injury by a Nosologist using principles of the International Classification of Diseases (ICD). This classification allows the arrangement of illnesses and injuries into like categories for analysis.

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Table 2. Standardized mortality ratios (SMR), 95% confidence intervals (CI), observed (obs) and expected (exp) numbers of deaths for Anniston workers by duration of employment.

Cause of Death (ICD Codes[2])	***< 10 Years Worked SMR(95%CI) [Obs/Exp]***	***10+ Years Worked SMR(95%CI) [Obs/Exp]***
All causes of death (0-999)	**0.5(0.1-1.5) 3/5.9**	**0.6(0.3-0.9) 18/31.0**
All cancer (140-209)	**0.9(0.0-4.8) 1/1.2**	**0.7(0.2-1.4) 6/9.2**
Colon (153)	**0.0(0.0-49.2) 0/0.1**	**1.3(0.0-7.5) 1/0.7**
Lung (162)	**0.0(0.0-12.3) 0/0.3**	**1.2(0.3-3.0) 4/3.4**
Breast (174)	**0.0(0.0-29.1) 0/0.1**	**0.0(0.0-22.2) 0/0.2**
Prostate (185)	**0.0(0.0-276.4) 0/0.01**	**0.0(0.0-7.1) 0/0.5**
All heart disease(390-398, 400.1, 400.9, 404, 404, 410-414,420-429)	**0.9(0.0-5.2) 1/1.1**	**0.6(0.2-1.2) 6/10.5**
All external causes of death (800-999)	**0.0(0.0-2.1) 0/1.8**	**1.2(0.2-3.5) 3/2.5**

[2] A unique code is assigned to each distinct illness and injury by a Nosologist using principles of the International Classification of Diseases (ICD). This classification allows the arrangement of illnesses and injuries into like categories for analysis.

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